



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

### Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

### About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

ENGIN, LI

TK

586.5

563

1922

A 757,921

# RADIO HOOK-UPS



A BOOK OF THE MOST ADVANCED CIRCUITS  
OF RECEIVERS, AMPLIFIERS AND TRANSMITTERS  
FOR DAMPED AND UNDAMPED WAVE WORK:

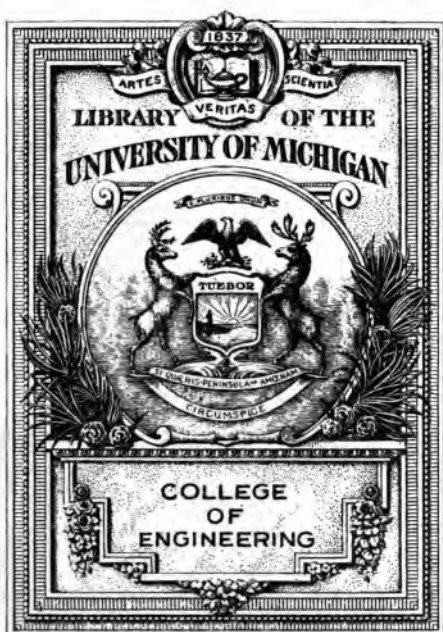
*By*

M. B. SLEEPER

⑤

EVERYDAY ENGINEERING SERIES  
NORMAN W. HENLEY PUBLISHING CO.  
2 WEST 45 TH. STREET, NEW YORK

1922 EDITION



Engl. Library

T.H.

5815

S. 3

1922













# RADIO HOOK-UPS

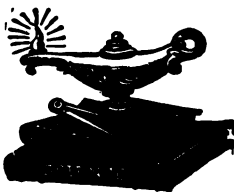
A REFERENCE AND RECORD BOOK  
OF CIRCUITS USED FOR CONNECT-  
ING WIRELESS INSTRUMENTS

THE MOST RECENT AND EFFICIENT DIAGRAMS  
ARE GIVEN FOR ALL TYPES OF CRYSTAL  
AND AUDION RECEIVERS FOR DAMPED  
AND UNDAMPED WAVES, SPARK  
COIL, TRANSFORMER, AND VACUUM  
TUBE TRANSMITTERS, AMPLIFIERS,  
OSCILLATORS, AND MEASURING  
APPARATUS. 18

PROVISION IS MADE FOR NOTES ON THE  
RESULTS OBTAINED WITH VARIOUS HOOK-  
UPS, GIVING THE EXPERIMENTER A COM-  
PLETE RECORD OF THE COMPARATIVE  
MERITS OF DIFFERENT CIRCUITS.

*John L. S.*  
**M. B. SLEEPER**

*Radio Editor of Everyday Engineering Magazine,  
Author of Design Data for Radio Transmitters and Receivers,  
Radio Experimenters' Handbook, Electric Bells, etc.*



NEW YORK  
THE NORMAN W. HENLEY PUBLISHING CO.  
2 WEST 45th STREET  
1922

Engin. - Repzacc  
W2nr  
11-6-25  
12487

COPYRIGHTED, 1920, 1922

BY

THE NORMAN W. HENLEY PUBLISHING CO.

PRINTED BY  
**Engineering**  
**Library**

Composition, Electrotyping and Press Work  
By Publishers Printing Company, New York

# INTERNATIONAL MORSE CODE AND CONVENTIONAL SIGNALS

TO BE USED FOR ALL GENERAL PUBLIC SERVICE

COMMUNICATION

1. A dash is equal to three dots.

3. The space between two letters is equal to three dots.

2. The space between parts of the same letter is equal to one dot.







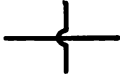






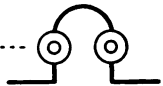

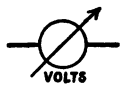

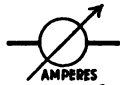



4. The space between two words is equal to five dots.

A . . . . .  
 B . . . . .  
 C . . . . .  
 D . . . . .  
 E . . . . .  
 F . . . . .  
 G . . . . .  
 H . . . . .  
 I . . . . .  
 J . . . . .  
 K . . . . .  
 L . . . . .  
 M . . . . .  
 N . . . . .  
 O . . . . .  
 P . . . . .  
 Q . . . . .  
 R . . . . .  
 S . . . . .  
 T . . . . .  
 U . . . . .  
 V . . . . .  
 W . . . . .  
 X . . . . .  
 Y . . . . .  
 Z . . . . .  
 Å (German)  
 Á or Ä (Spanish-Scandinavian)  
 CH (German-Spanish)  
 É (French)  
 Ñ (Spanish)  
 Ö (German)  
 Ü (German)  
 1 . . . . .  
 2 . . . . .  
 3 . . . . .  
 4 . . . . .  
 5 . . . . .  
 6 . . . . .  
 7 . . . . .  
 8 . . . . .  
 9 . . . . .  
 0 . . . . .

Period . . . . .  
 Semicolon . . . . .  
 Comma . . . . .  
 Colon . . . . .  
 Interrogation . . . . .  
 Exclamation point . . . . .  
 Apostrophe . . . . .  
 Hyphen . . . . .  
 Bar indicating fraction . . . . .  
 Parenthesis . . . . .  
 Inverted commas . . . . .  
 Underline . . . . .  
 Double dash . . . . .  
 Distress Call . . . . .  
 Attention call to precede every transmission . . . . .  
 General inquiry call . . . . .  
 From (de) . . . . .  
 Invitation to transmit (go ahead) . . . . .  
 Warning—high power . . . . .  
 Question (please repeat after . . . . .)—interrupting long messages . . . . .  
 Wait . . . . .  
 Break (Bk.) (double dash) . . . . .  
 Understand . . . . .  
 Error . . . . .  
 Received (O. K.) . . . . .  
 Position report (to precede all position messages) . . . . .  
 End of each message (cross) . . . . .  
 Transmission finished (end of work) (conclusion of correspondence) . . . . .

Please 3-27-42 M/L

# ~ LIST OF SYMBOLS ~

Antenna -----		or		or	
Ground -----					
Wire Connections ----		or			
No Connections of Wires -----					
Fixed Resistance -----					
Variable Resistance -----		or			
Vacuum Tube -----		or		or	
Telephone Receivers -----					
Voltmeter -----		or			
Ammeter -----		or			
Galvanometer -----		or			
Crystal Detector -----					

# ~ LIST OF SYMBOLS ~

Battery .....			
Direct Current Dynamo ...		or	
Alternating Current Generator }		or	
Fixed Capacitance (Condenser) .....		or	
Variable Capacitance (Var. Condenser) .....			
Fixed Inductance (Air Core Coil) .....			
Variable Inductance (Air Core Coil) .....		or	
Variometer (Variable Inductance)---			
Fixed Coupling of Coils (Fixed Inductive Coupling) .....			
Variable Coupling of Coils .....			
Transformer .....			
Iron Core Inductance (or Reactance Coil) .....			

# INTERNATIONAL RADIOTELEGRAPHIC CONVENTION

## LIST OF ABBREVIATIONS TO BE USED IN RADIO COMMUNICATION

ABBREVIATION.	QUESTION.	ANSWER OR NOTICE.
PRB	Do you wish to communicate by means of the International Signal Code?	I wish to communicate by means of the International Signal Code.
QRA	What ship or coast station is that?	This is.....
QRB	What is your distance?	My distance is.....
QRC	What is your true bearing?	My true bearing is..... degrees.
QRD	Where are you bound for?	I am bound for.....
QRE	Where are you bound from?	I am bound from.....
QRF	What line do you belong to?	I belong to the..... Line.
QRG	What is your wave length in meters?	My wave length is..... meters.
QRJ	How many words have you to send?	I have..... words to send.
QRK	How do you receive me?	I am receiving well.
QRL	Are you receiving badly? Shall I send 30?..... • • • • • for adjustment?	I am receiving badly. Please send 30, • • • • • for adjustment.
QRM	Are you being Interfered with?	I am being Interfered with.
QRN	Are the atmospherics strong?	Atmospherics are very strong.
QRO	Shall I increase power?	Increase power.
QRP	Shall I decrease power?	Decrease power.
QRQ	Shall I send faster?	Send faster.
QRS	Shall I send slower?	Send slower.
QRT	Shall I stop sending?	Stop sending.
QRU	Have you anything for me?	I have nothing for you.
QRV	Are you ready?	I am ready. All right now.
QRW	Are you busy?	I am busy (or: I am busy with.....). Please do not interfere.
QRX	Shall I stand by?	Stand by. I will call you when required.
QRY	When will be my turn?	Your turn will be No. ....
QSA	Are my signals weak?	Your signals are weak.
QSB	Are my signals strong?	Your signals are strong.
QSC	Is my tone bad?	The tone is bad.
QSD	Is my spark bad?	The spark is bad.
QSE	Is my spacing bad?	Your spacing is bad.
QSF	What is your time?	My time is.....
QSG	Is transmission to be in alternate order or in series?	Transmission will be in alternate order.
QSH	.....	Transmission will be in series of 5 messages.
QSI	.....	Transmission will be in series of 10 messages.
QSK	What rate shall I collect for?	Collect.....
QSL	Is the last radiogram canceled?	The last radiogram is canceled.
QSM	Did you get my receipt?	Please acknowledge.
QSN	What is your true course?	My true course is..... degrees.
QSO	Are you in communication with land?	I am not in communication with land.
QSP	Are you in communication with any ship or station (or: with.....)?	I am in communication with..... (through.....).
QSQ	Shall I inform..... that you are calling him?	Inform..... that I am calling him.
QSR	Is..... calling me?	You are being called by.....
QST	Will you forward the radiogram?	I will forward the radiogram.
QSU	Have you received the general call?	General call to all stations.
QSV	Please call me when you have finished (or: at..... o'clock)?	Will call when I have finished.
QSW	Is public correspondence being handled?	Public correspondence is being handled.
QSX	Shall I increase my spark frequency?	Please do not interfere.
QSY	Shall I decrease my spark frequency?	Increase your spark frequency.
QSZ	Shall I send on a wave length of..... meters?	Decrease your spark frequency.
QTA	.....	Let us change to the wave length of..... meters.
QTB	.....	Send each word twice. I have difficulty in receiving you.
QTC	.....	Repeat the last radiogram.

\*Public correspondence is any radio work, official or private, handled on commercial wave lengths. When an abbreviation is followed by a mark of interrogation, it refers to the question indicated for that abbreviation.

## INTRODUCTION

The circuits contained in this book have been carefully chosen from the great variety which have been used for different purposes. All freak diagrams and those which are unnecessarily complicated have been eliminated.

No attempt has been made to include every known circuit. So many audion hook-ups, for example, contain entirely too many unnecessary instruments. The diagrams given here are the most practical and the most satisfactory known.

This elimination of non-essentials is a part of the policy which has been followed thruout the Radio Department of Everyday Engineering, a policy which has won universal approval among the radio experimenters.

Circuits developed subsequent to the publication of this book will be found in the current issues of Everyday.

MAY, 1922.



# Radio Hook-Ups

1. This is the simplest receiving circuit that can be used. The detector is connected between the antenna and ground, with the phones in shunt.

The set will respond over a rather broad range of wavelengths, since such a large amount of resistance is introduced into the antenna circuit.

Notes:

2. By using a single slide tuner, the receiving set can be adjusted to the wavelength of the incoming signals. Good results can be obtained with this system, though the tuning is not sharp enough to cut out any serious interference.

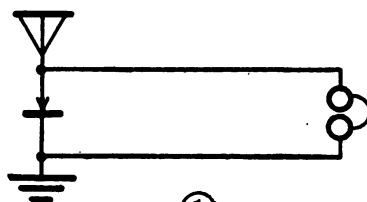
Notes:

3. Adding a variable condenser of 0.005 or 0.001 mfd. maximum capacity helps to increase the sharpness of tuning. When used with a Short Range antenna, a set of this sort, having a good crystal detector, will copy Arlington time signals over a distance of several hundred miles.

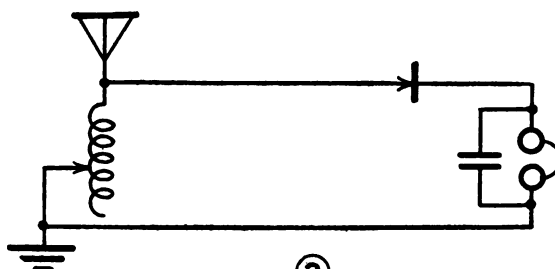
Notes:

4. Here a tuning coil, similar to the one described in 2, is tapped at 0,  $\frac{1}{2}$ , 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 inches. The substitution of a switch for the slider does not give quite as sharp tuning, but simplifies the design of the apparatus. A coil of this sort can be connected in series with a single slide tuner to act as a loading coil for longer wavelengths.

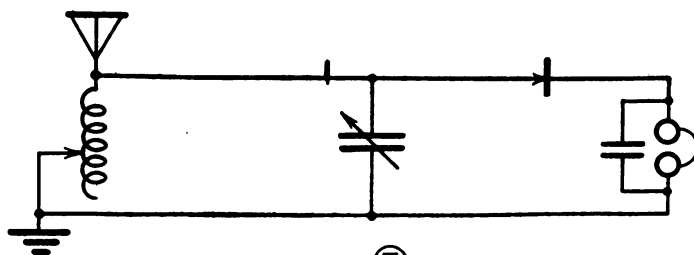
Notes:



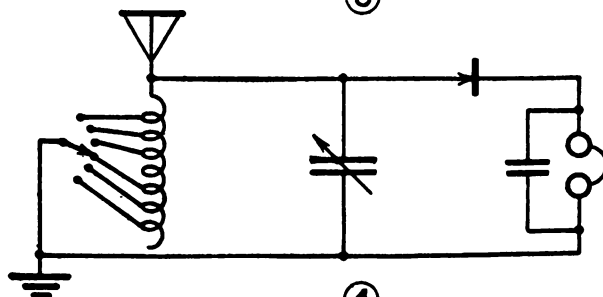
①



②



③



④

5. Efficiency is increased by the use of two sliders, for more accurate tuning can be accomplished. A coil of the dimensions given in 4 will serve for the two slide tuner. The path over which the sliders travel should be dusted off frequently so that the copper grains worn off will not short-circuit the turns.

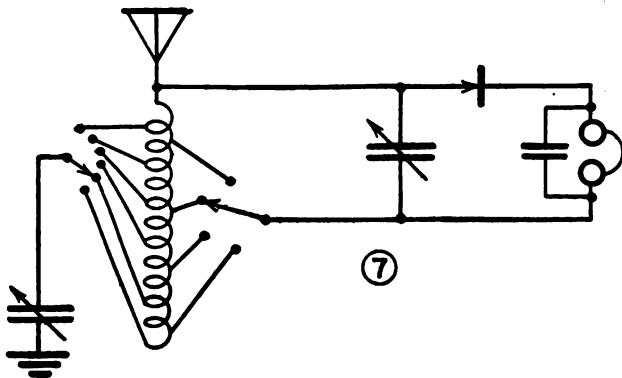
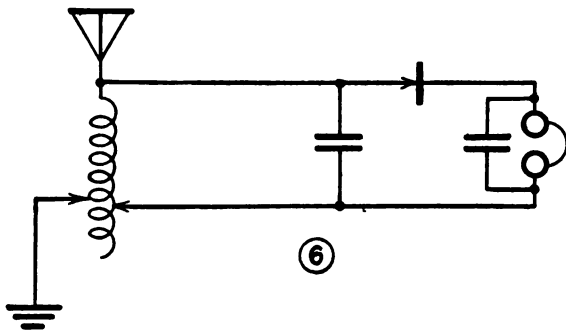
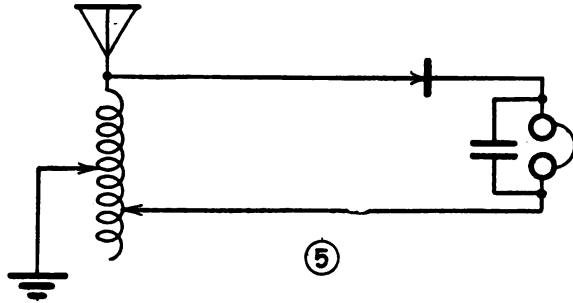
Notes:

6. Sharper tuning and better signals are produced when a variable air condenser is shunted across the detector circuit. This will give better results than 3. When used with the coil described in 4 and a condenser of 0.001 mfd. maximum, the circuit will respond to wavelengths up to 2,800 meters, approximately.

Notes:

7. Switches are substituted for sliders. The ground circuit switch has 10 taps, taken off at  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 2, 3, 4, 5,  $6\frac{1}{4}$ ,  $7\frac{1}{2}$ , 8 and 10 inches from the start of the winding. Detector circuit taps are at 1, 2, 4, 6, 8 and 10 inches. The ground circuit condenser is of 0.001 mfd., and the detector circuit condenser of 0.0005 mfd. maximum. Such a set will give sharp tuning and operate at high efficiency.

Notes:



8. A three-slide tuner gives a slight coupling effect by moving both detector circuit sliders toward or away from the part of the coil included in the antenna circuit. There is really very little advantage in the three-slide type, however.

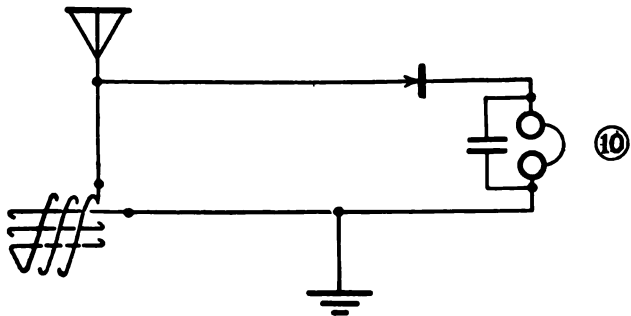
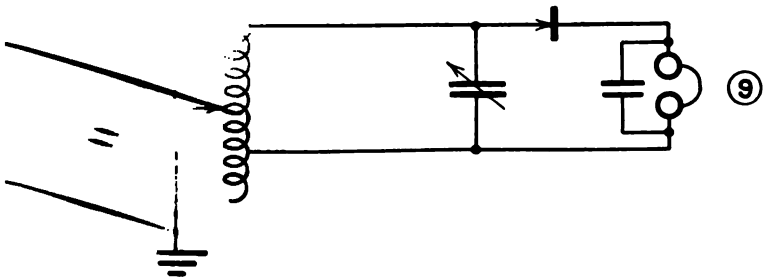
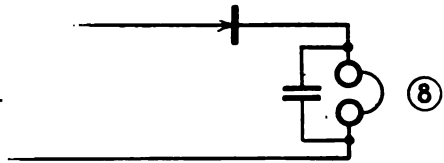
Notes:

9. Tuning condensers are added to the three-slide tuner. The antenna condenser should have a maximum capacity of 0.0005 mfd., and the detector circuit condenser, 0.001 mfd. The use of these condensers increase the wavelength range considerably.

Notes:

10. When a very small wavelength range is required, a variometer can be used, connected in a way similar to the circuit of a single slide tuner. For receiving 200-meter stations, the inner coil may be  $3\frac{1}{2}$  inches in diameter, wound with 20 turns of No. 24 s.s.c. wire, and the outer coil, 4 inches in diameter, wound with 15 turns of No. 24 s.s.c. wire.

Notes:



11. The addition of a condenser of 0.001 mfd. increases the wavelength range. Larger variometers can be made to cover a very considerable range of wavelengths.

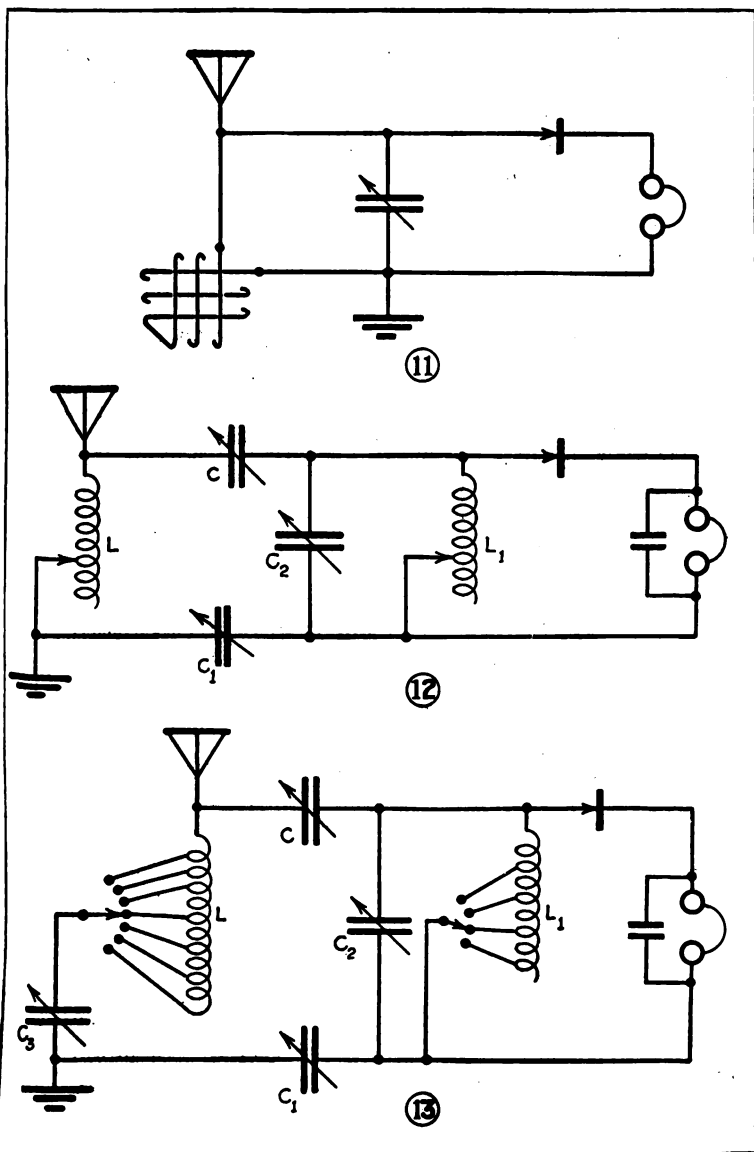
Notes:

12. Capacity coupling between the antenna and secondary or detector circuit gives sharper tuning than with closely coupled circuits. Condenser C and  $C_1$  are mounted on the same shaft, and should have a capacity of 0.0005 mfd.  $C_2$  and  $L_1$  comprise the secondary circuit. They are not affected by changes of C and  $C_1$ .  $C_2$  should be of 0.001 mfd.

Notes:

13. Switches are used for the primary and secondary circuits, with variable condensers for close tuning. Coil L should be half as large again as  $L_1$ . C and  $C_1$  are the same as in 12, while  $C_2$  is of 0.005 mfd., and  $C_3$ , 0.001 mfd. capacity. This is an interesting experimental circuit, and has been used for Navy equipment, though the capacity coupling is not considered as efficient as inductive coupling.

Notes:





14. A simple form of inductive coupling. The primary and secondary coils are set up a foot or more apart, or at right angles. Coupling is effected by a closed circuit having two turns around both primary and secondary coils.

Notes:

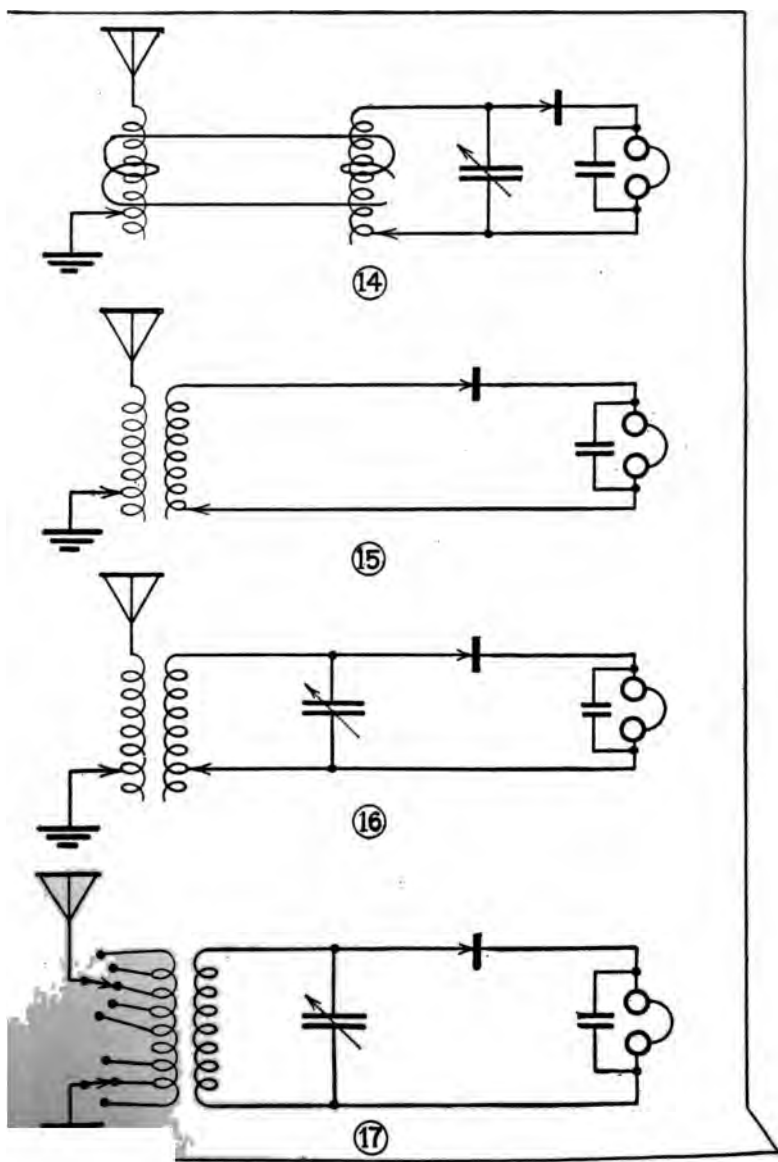
15. This is a loosely coupled set, in which the secondary slides in or out of the primary. At maximum coupling the tuning is broad and the signals loud. For sharp tuning during interference, the coupling is reduced by pulling out the secondary.

Notes:

16. Adding a variable condenser of 0.0005 mfd. makes the tuning still sharper, and increases the signal strength. A good loose coupler for reception up to several thousand meters can be made with a primary 6 inches long,  $3\frac{1}{2}$  inches in diameter wound with No. 24 s.s.c. wire; the secondary 5 inches long, 3 inches in diameter, also wound with No. 24 s.s.c. wire.

Notes:

17. Units and tens switches are used on the primary of this coupler. Taps for the units switch are taken off every ten turns, and taps for the tens switch, every twenty turns.



18. Switches are used for large inductance variations in the primary and secondary. A series condenser in the primary circuit gives a close adjustment of the wavelength, while the secondary has a shunt condenser for the same purpose. It will be found that with the series primary condenser a larger number of taps are needed than in the secondary.

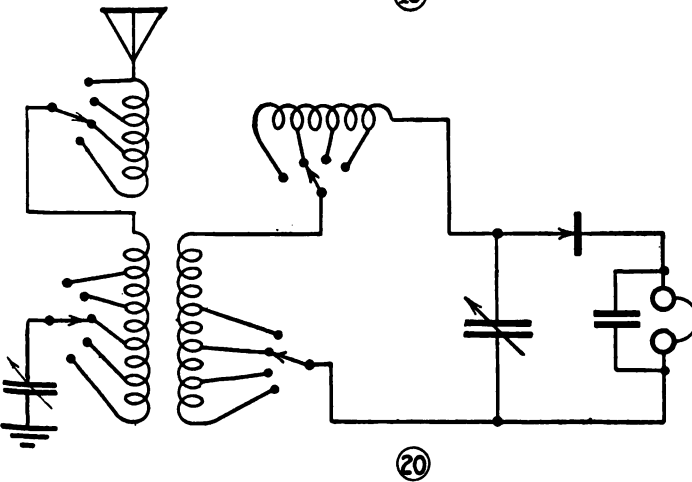
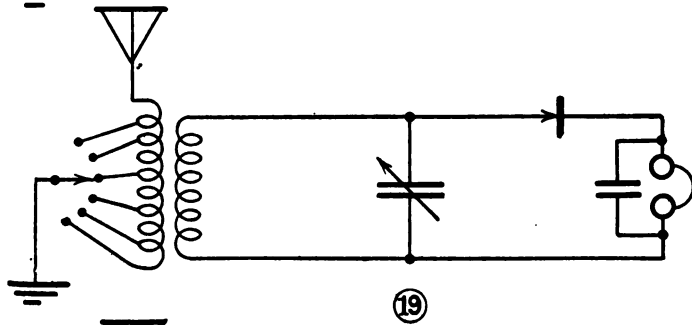
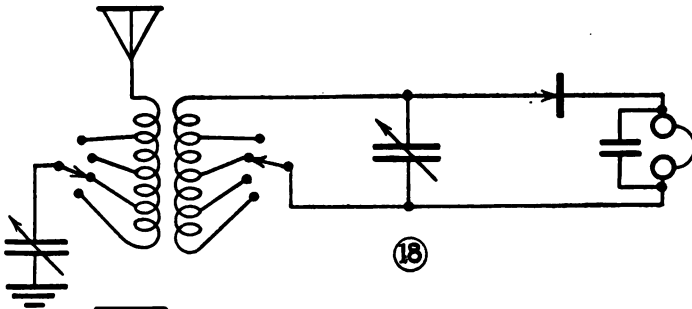
Notes:

19. This circuit is for very short wavelengths where in the primary the only adjustment is a series of taps taken off at every second or third turn. The entire secondary tuning is accomplished by the shunt condenser. With a 0.001 mfd. condenser a wavelength range of 200 to 800 meters can be covered.

Notes:

20. Loading coils should be used in both primary and secondary circuits in order that they can be tuned to the same wavelength. The loading coils are adjustable in large steps, while the primary and secondary coils have small steps between which tuning is done, by means of a variable condenser. It should be remembered that the minimum capacity of a primary series condenser should not be less than one-half the capacity of the antenna, or for most work 0.00025 mfd.

Notes:

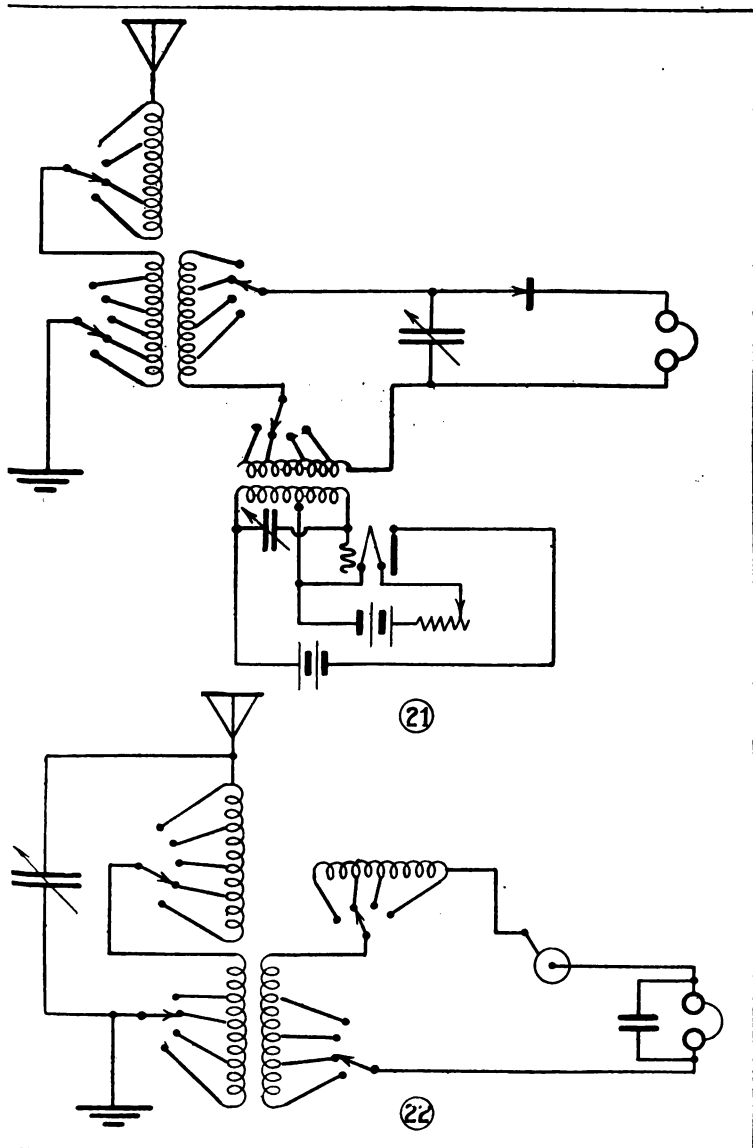


21. The use of an audion oscillator coupled to a crystal detector receiving set makes possible the reception of undamped waves. The oscillator coil is tapped at the center for connection to the filament. This coil is coupled loosely to the secondary loading coil or to a small non-adjustable coupling coil, if all the inductance is contained in the secondary of the loose coupler. While not as efficient as an audion receiver for undamped waves, this circuit can be used for considerable distances.

Notes:

22. Another way to receive undamped waves is by the use of a tikker. This is simply a brass disc rotated by a motor with a spring contact on the disc. The varying resistance of the contact breaks up the high frequency undamped waves into audio frequency groups. A shunt primary condenser is used for an additional wavelength range, though it does not give as sharp tuning as a series condenser.

Notes:



23. This is the simplest circuit for a damped wave audion receiver. Only a single slide coil is used for tuning. The fixed condenser connected to the grid is of the postage-stamp type.

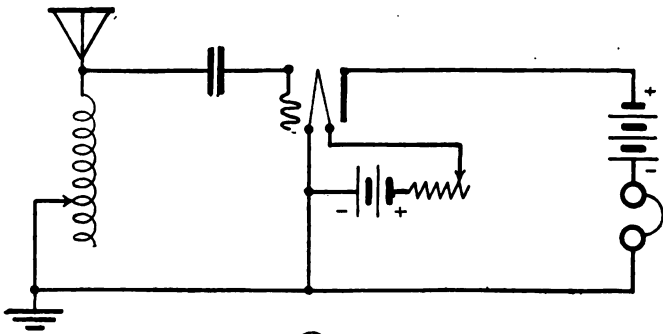
Notes:

24. Excellent results can be obtained with the combination of a single slide tuner and variable condenser. Some experimenters prefer to connect the audion around the inductance instead of the condenser, though it makes very little difference.

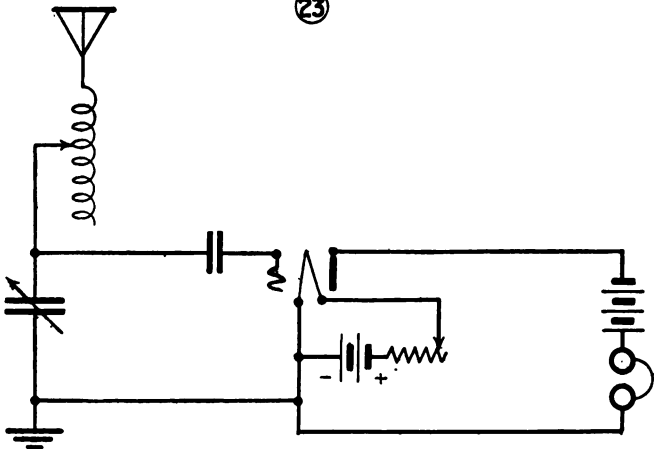
Notes:

25. A two-slide tuner and variable condenser are used for tuning here. In operating an audion circuit it is always well to keep in mind that the lower the brilliancy of the filament the longer the audion bulb and B battery will last.

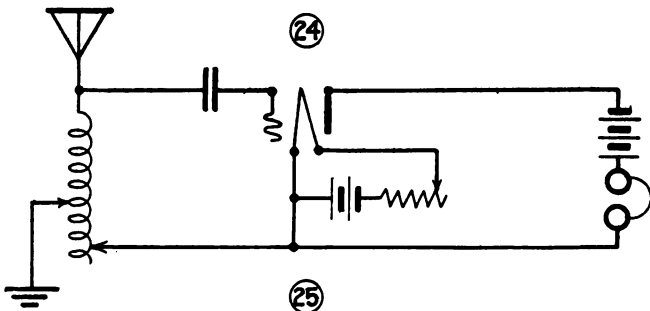
Notes:



23



24



25



26. If it is desired, a three-slide tuner can be connected with an audion. A series condenser in the ground circuit and a shunt condenser in the secondary circuit have been added for sharp tuning. Audion bulbs now on the market require about 20 volts for the B battery. No potentiometer or voltage control is shown in these diagrams, because the 22.5-volt batteries operate the audion at maximum efficiency.

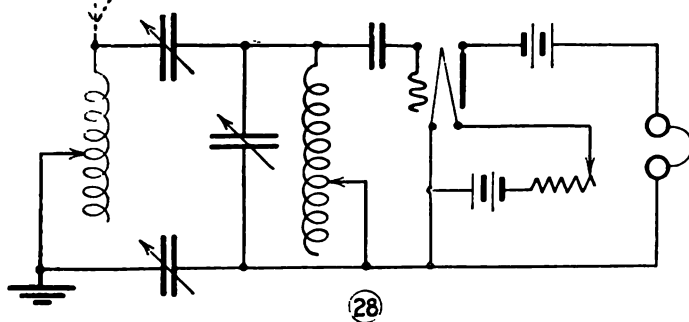
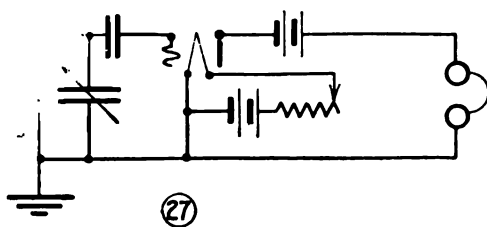
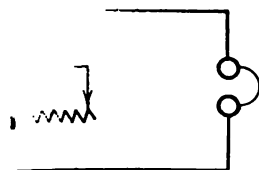
Notes:

27. Variometers can be used where a great wavelength range is not necessary. They are particularly good for 200 meter work. The variable condenser can be omitted, although efficiency will be sacrificed.

Notes:

28. Capacity coupling is illustrated in this diagram. Tuning is done by means of the two adjustable inductances and the shunt condenser. The two series condensers which vary the coupling are mounted so that they can be controlled by the same handle. Capacity coupling is closely equivalent to the ordinary loose or inductive coupling. Changing the capacity of the coupling condensers does not vary the wavelength of the circuits.

Notes:



29. A simple loosely coupled circuit for the audion detector. It is advisable, although not absolutely necessary, to use a condenser across the secondary of the loose coupler.

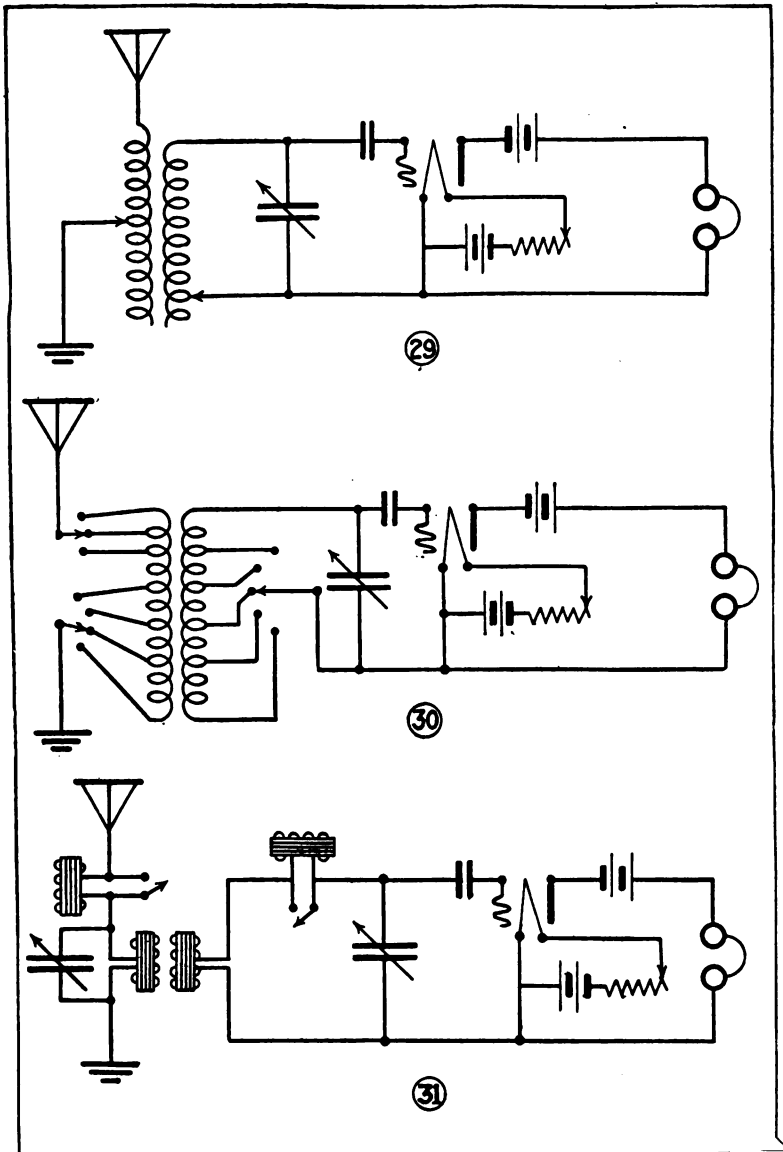
Notes:

30. Units and tens switches are used on the primary of this coupler. The secondary is adjustable in steps with a variable condenser for the intermediate wavelengths.

Notes:

31. A circuit using G. A. or honeycomb coils without taps. A loading coil is inserted in the antenna which can be cut out by a short-circuiting switch. Tuning is accomplished by the primary shunt condenser. A loading coil is also provided in the secondary circuit. This is particularly good for long wave work.

Notes:



32. Tickler coil coupling between the plate and grid circuits makes possible the reception of undamped waves. The tickler coil should have approximately  $\frac{1}{4}$  the inductance of the secondary.

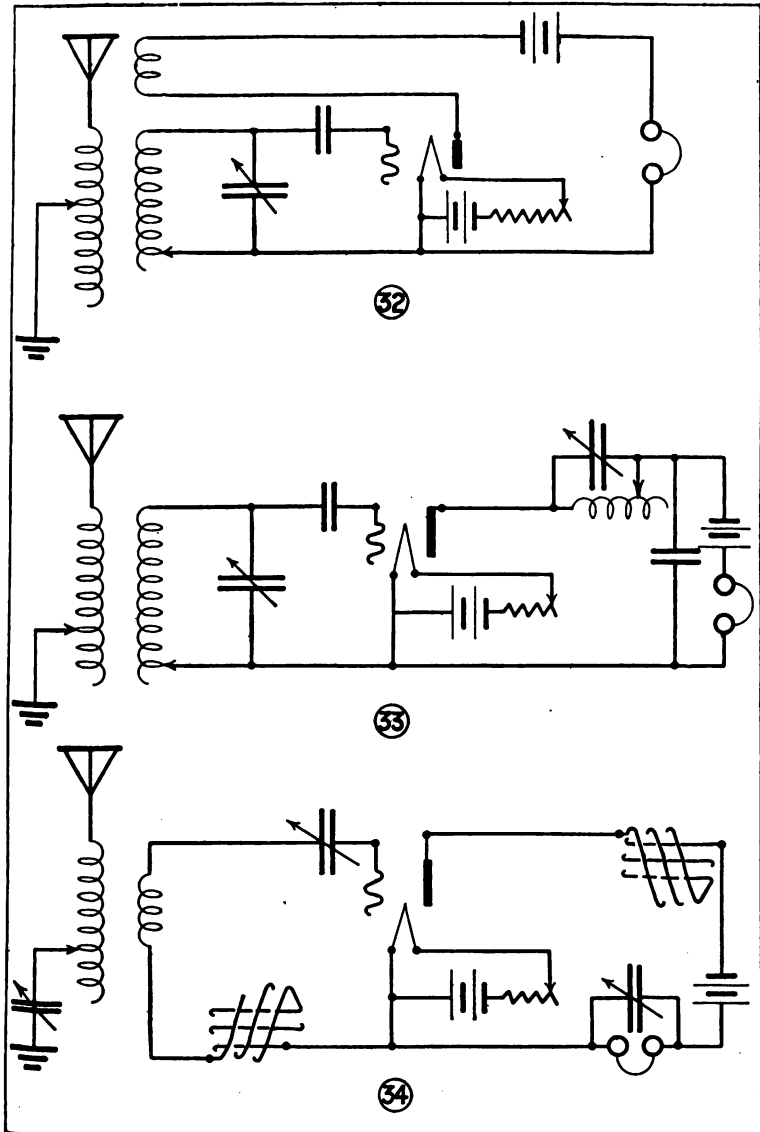
Notes:

33. A tuned circuit in the plate can also be used for undamped waves. The coil and condenser should have approximately the same inductance and capacity as the secondary of the loose coupler and the secondary tuning coil.

Notes:

34. A small coupling coil with a secondary variometer makes this circuit adaptable for short wave work. Another variometer is inserted in the plate circuit with a 0.0005 mfd. condenser around the telephones.

Notes:



35. G. A. or honeycomb coils connected for undamped wave reception. Coupling is varied by swinging the primary coil and the strength of the oscillations by moving the tickler coil.

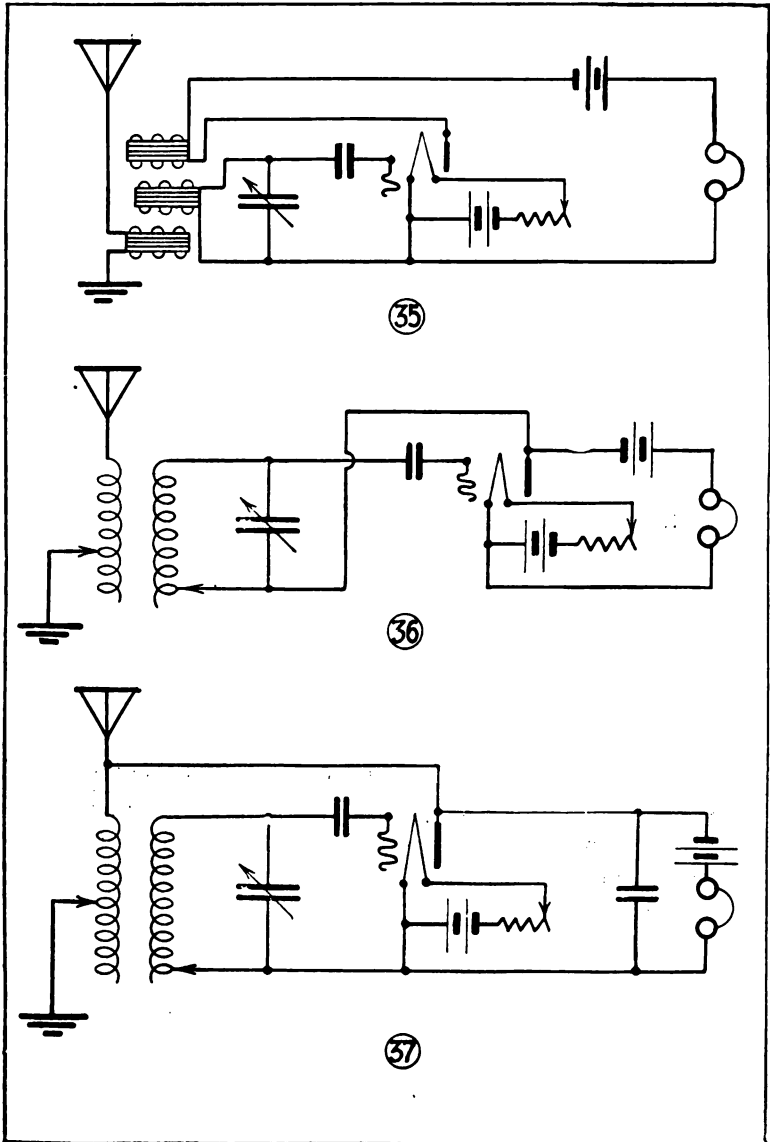
Notes:

36. The original ultra-audion circuit. One end of the secondary is connected to the plate instead of to the filament as in the case of other audion circuits.

Notes:

37. Here a feed back effect is obtained by connecting the plate to the antenna. A condenser of 0.001 mfd. is shunted across the telephones. This circuit is not particularly good for undamped wave work because the strength of the oscillations cannot be readily controlled.

Notes:





38. A small variable air condenser is put across the grid and plate to provide a feed-back coupling.

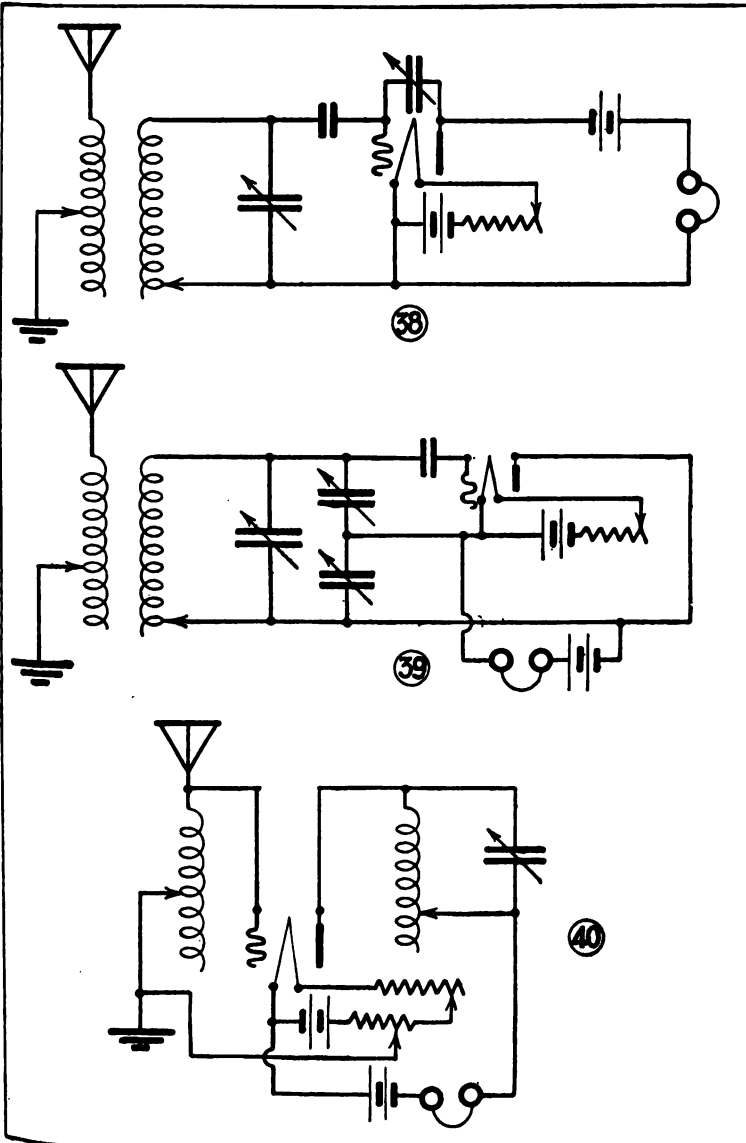
Notes:

39. An Eaton oscillator circuit. Two small condensers, either fixed or variable, are connected across the secondary condenser with a tap taken from the center to the filament. If variable condensers are used the oscillations can be readily controlled.

Notes:

40. A loose coupler wired so that the primary and secondary furnish feed back coupling for undamped wave reception. A 0.001 mfd. condenser around the secondary is used for tuning.

Notes:

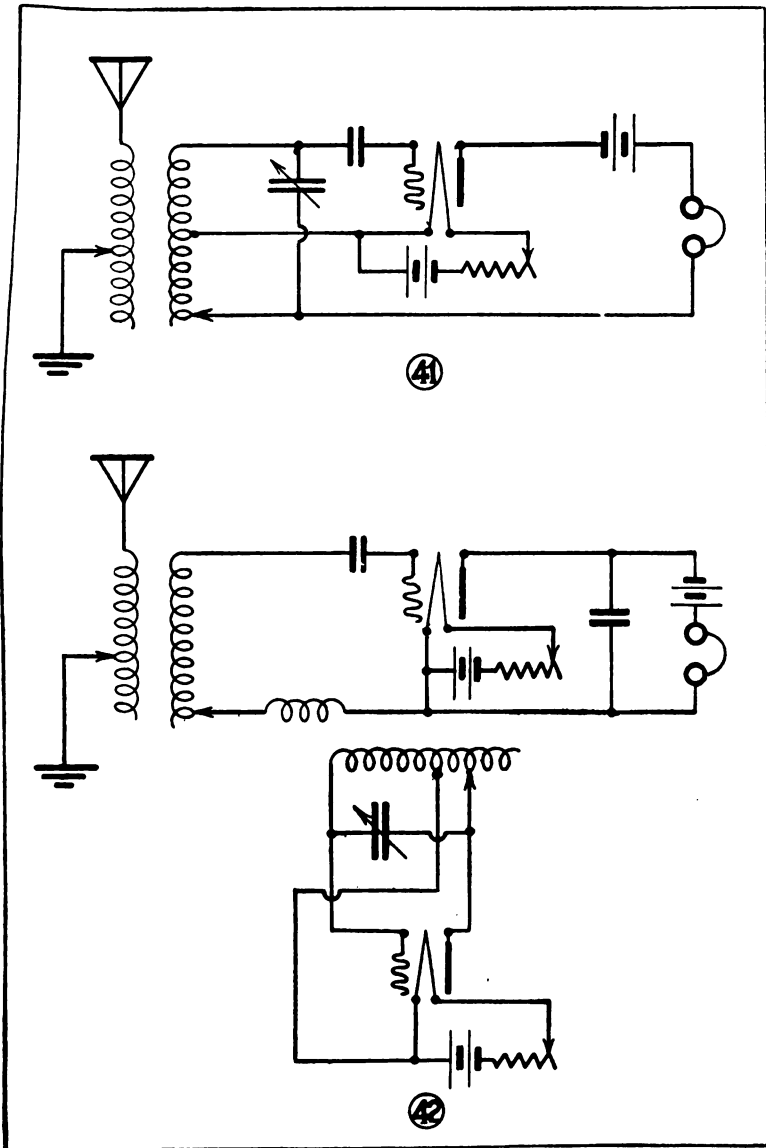


41. The secondary circuit really is an oscillator coupled to the primary coil. The tap to the filament should be taken off a little below the center point. Undamped waves can be received in this manner.

Notes:

42. The most efficient way to receive undamped waves is by the use of a separate oscillator. This diagram shows an ordinary spark receiving circuit to which an oscillator is connected. The circuit of the oscillator is the same as the secondary of diagram 41.

Notes:

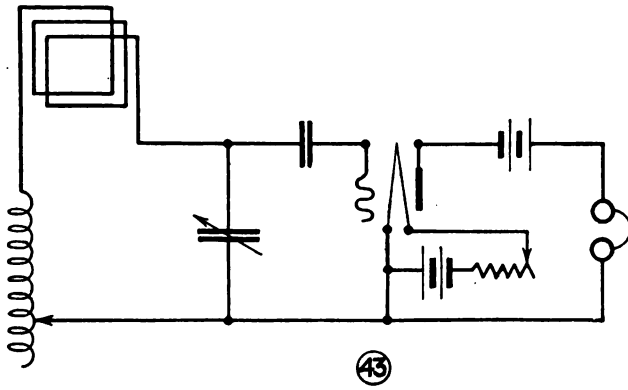


43. A loop antenna with a loading inductance and tuning condenser for directional reception. Signals are loudest when the horizontal turns of the loop point toward the transmitting station. This is called a bilateral radio compass.

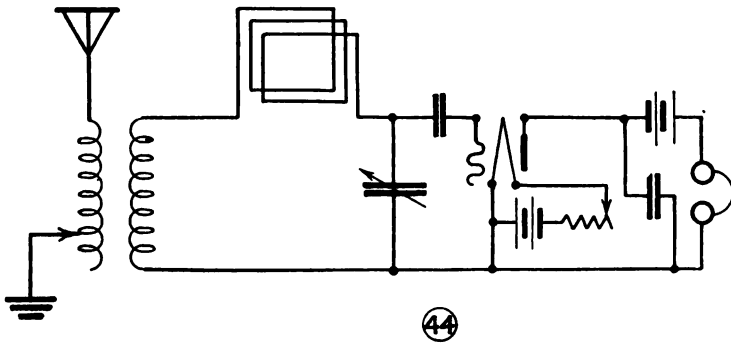
Notes:

44. Unilateral connections for a loop receiver. The loop is connected to the secondary of a loose coupler and the regular antenna to the primary. When signals are received simultaneously and the coupling properly adjusted, maximum and minimum sides will be found. The transmitter is in the direction of the loudest signals.

Notes:



43



44

45. Either unilateral or bilateral receiving can be done on this circuit. The ground connection must be open if the loop is used alone for bilateral work.

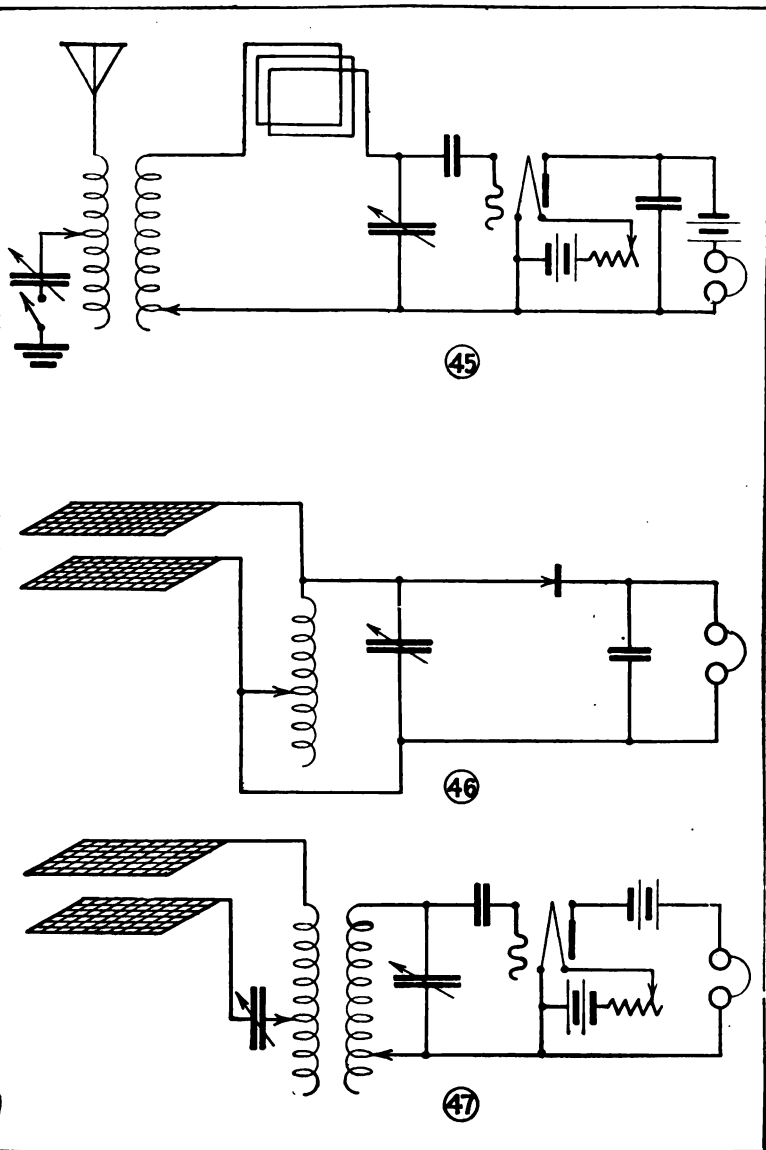
Notes:

46. The electro-static antenna is made of sheets of copper netting separated from six to twelve inches. The upper plate acts as the antenna and the lower plate as the ground.

Notes:

47. Here the condenser antenna is connected to a loosely coupled receiving set. The instruments are used in the same way as if an ordinary antenna and ground connection were employed.

Notes:





48. Connections for a tone condenser used for receiving very short undamped waves. The circuit is tuned to the frequency of the transmitter and the tone condenser gives an adjustment, as it revolves, above and below that wavelength. The note in the receivers is determined by the speed of the tone condenser.

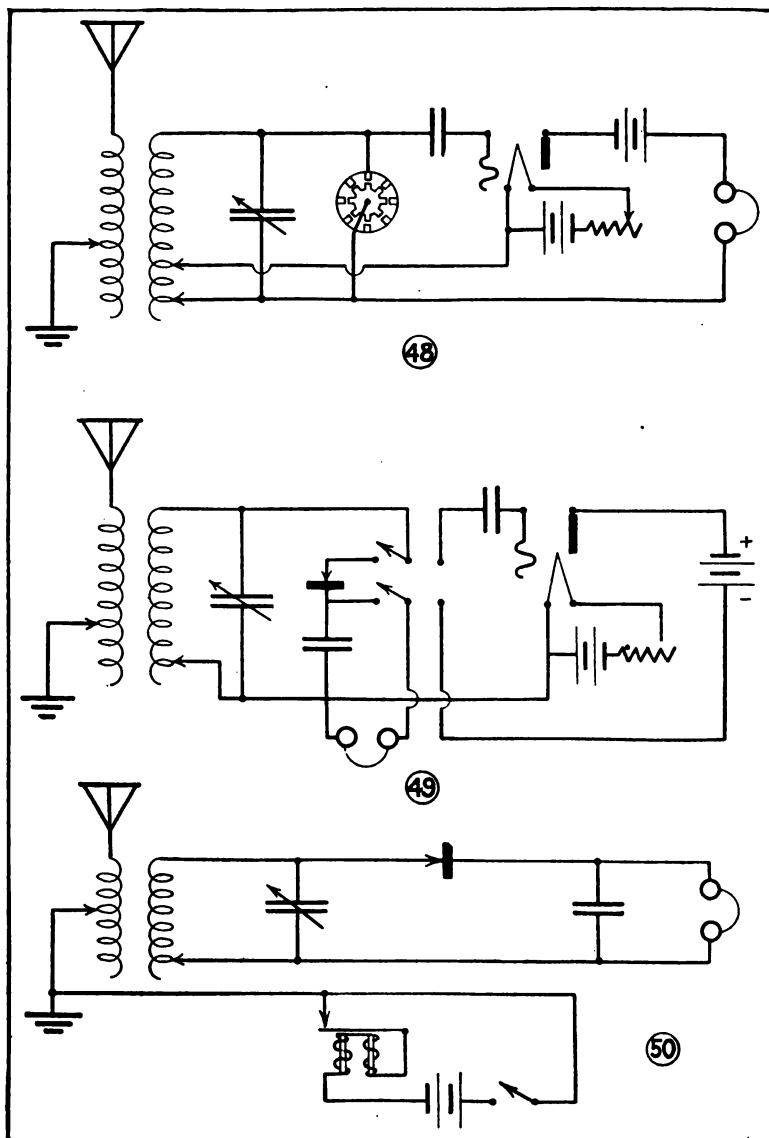
Notes:

49. By changing over the double pole and double throw circuit either audion detector or crystal can be cut into the receiving circuit.

Notes:

50. Diagram of a buzzer test for use with either a crystal or audion receiver. The buzzer is connected with a battery and switch, and a lead run from the vibrator screw of the buzzer to the receiving set ground.

Notes:



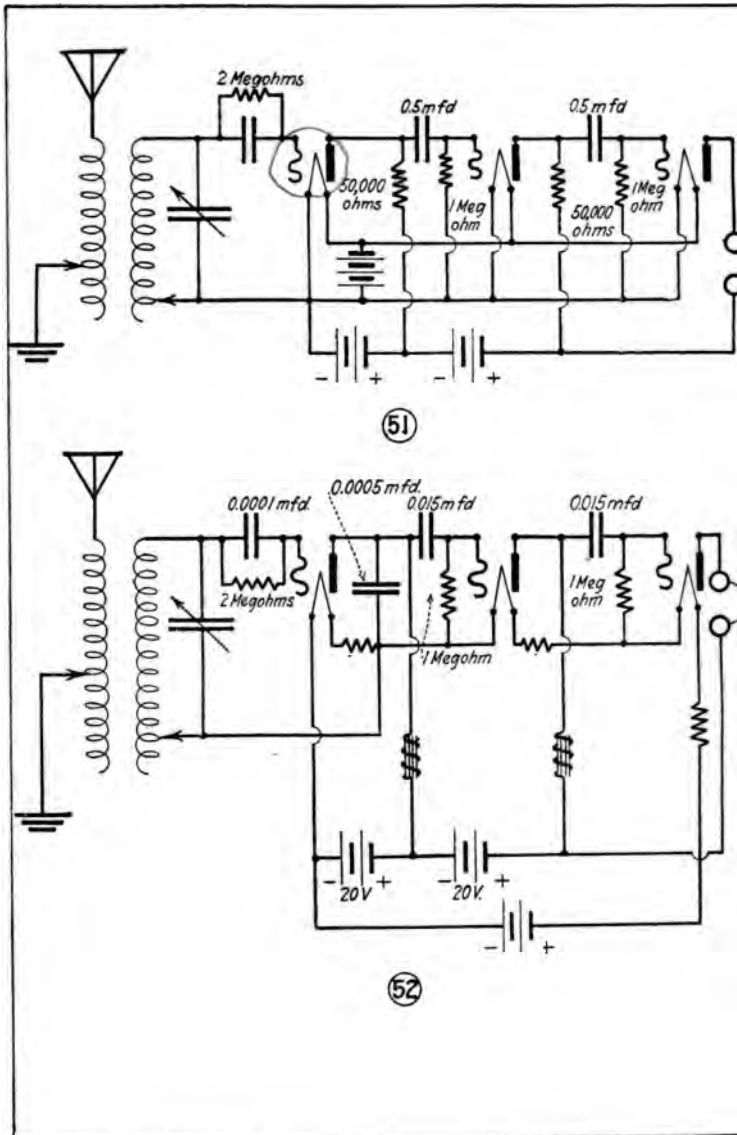
51. A resistance coupled amplifier is shown in this diagram. Dimensions for the condensers and resistances are shown. This circuit is for audio frequency amplification. Additional stages can be connected on in the same manner as is the last step.

For radio frequency amplification the grid condenser can be omitted from the first audion and the second audion connected as the first stage as shown in the diagram.

Notes:

52. This is an impedance coupled amplifier. The impedances should have a reactance value at 700 cycles equal to the impedance of the tube which is usually 50,000 ohms. Small variable resistances are inserted in the filament circuit to give a slight negative charge to the grid.

Notes:



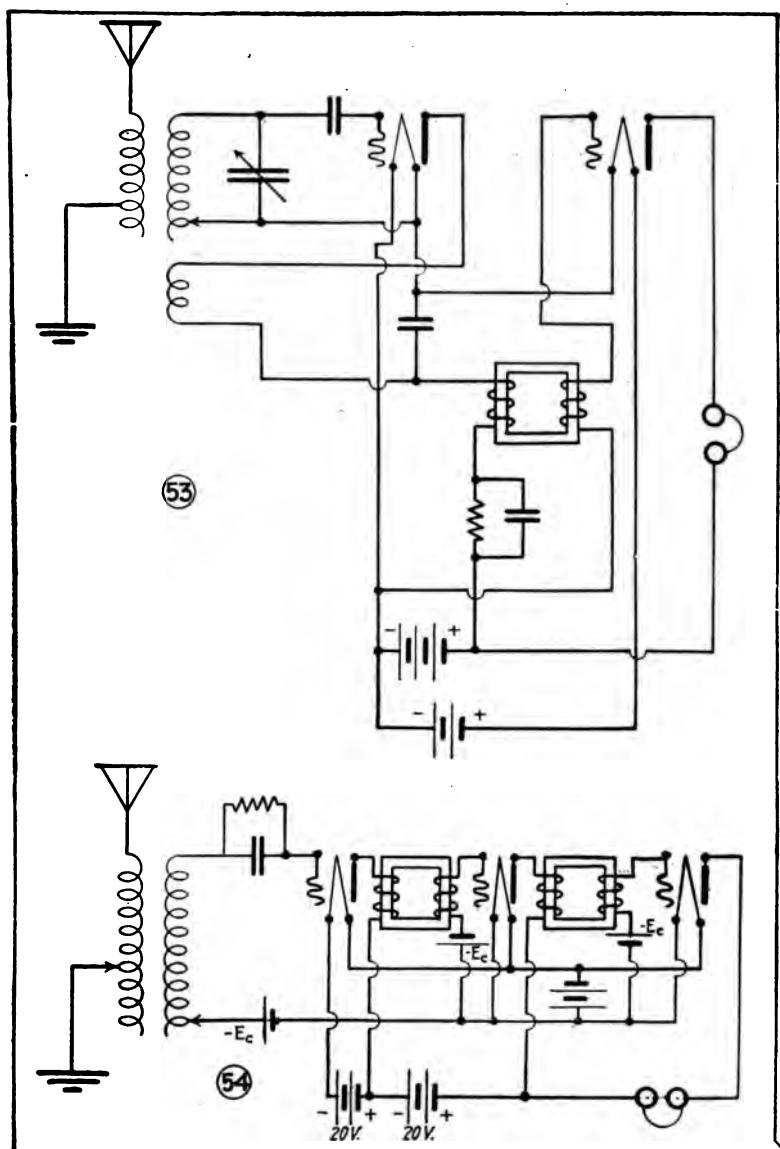
53. A one step transformer coupled amplifier with a tickler coil for undamped wave reception for the regeneration of spark signals. The fixed condensers in the amplifier circuit can be omitted, though they add to the efficiency of the circuit.

Notes :

54. A detector and two-stage transformer coupled amplifier. Small batteries marked  $-E_c$  are inserted in the grid circuit to give clearer amplification. It is advisable to have these batteries adjustable so that the amount of negative grid voltage can be adjusted while the apparatus is in operation.

Notes :



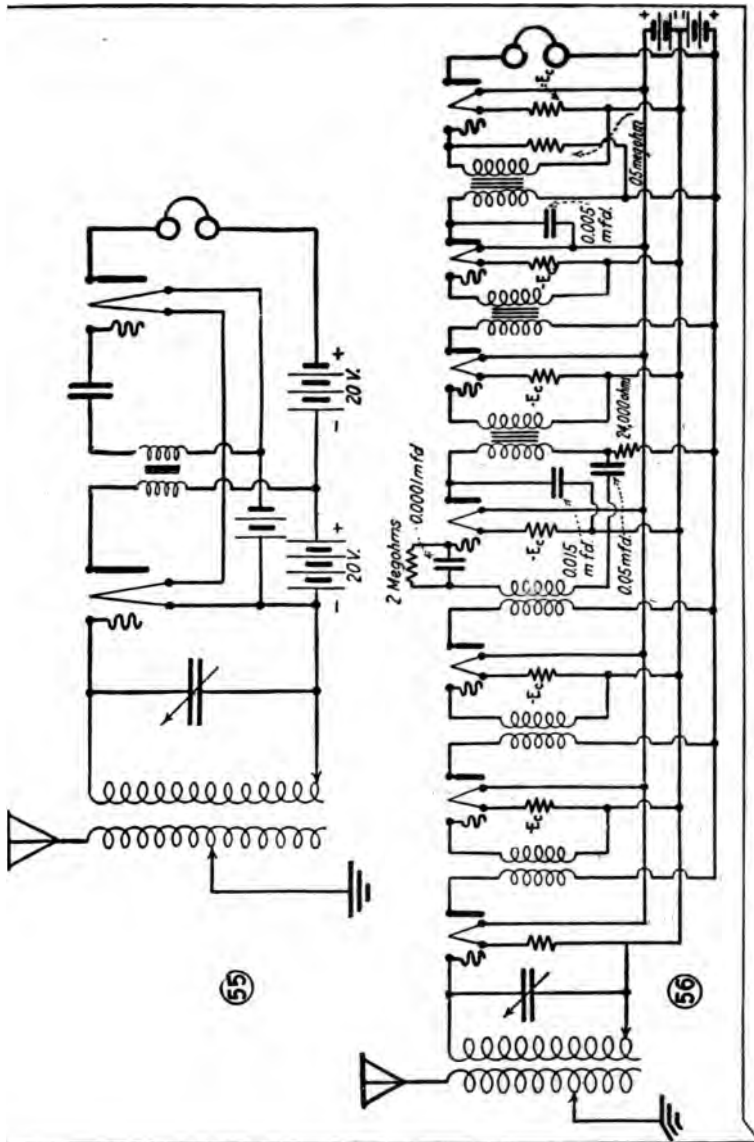


55. A radio frequency amplifier with an iron core transformer is shown in this diagram. The second audion acts as a detector for the radio frequency amplified by the first tube.

Notes:

56. Here are connections for a six-step amplifier having three stages of radio frequency amplification, a detector and three stages of audio frequency amplification. Adjustable resistances should be inserted in the grid circuits so that the amplification can be effected without distorting the incoming signals. This is particularly necessary for the reception of the radio telephone. Amplifiers connected in this manner have been carried out to fifteen or more stages.

Notes:





57. A buzzer transmitter in which the sending condenser and primary of the oscillation transformer are shunted across the break in the buzzer. Buzzers carrying up to 100 watts have been used in this way. A small buzzer with a 6 volt battery will transmit several miles if a good receiver is used.

Notes:

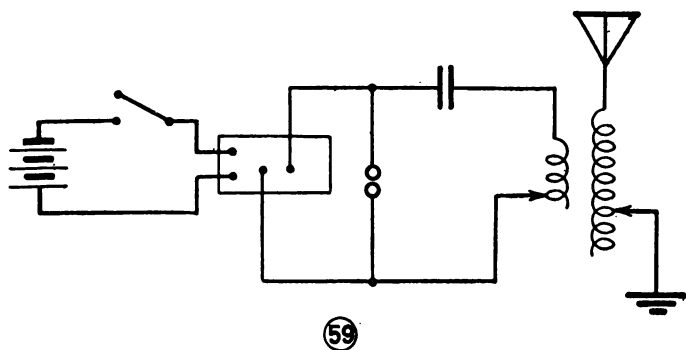
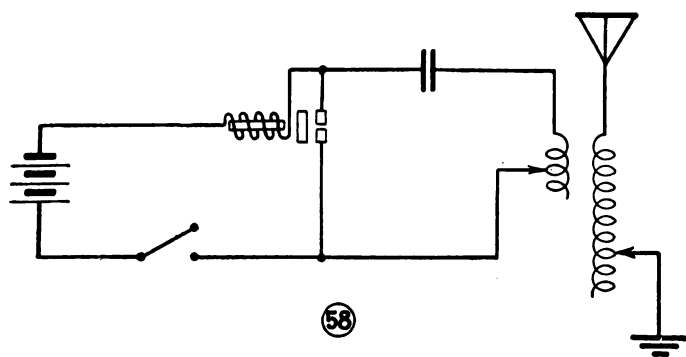
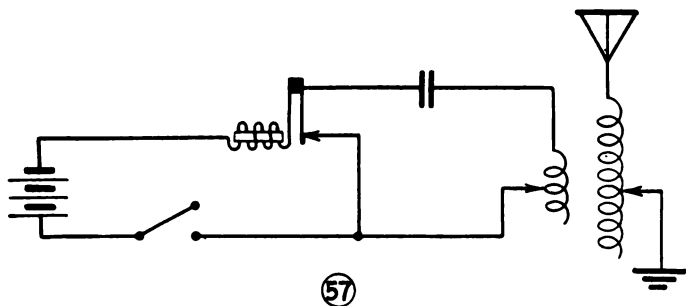
58. A method for using higher currents is shown in this circuit. The vibrator carries a contact which closes the circuit across two separate contacts.

Notes:

✱

59. This is a diagram of a spark coil transmitter. In order to comply with the radio law, it is almost essential to use an oscillation transformer instead of a helix.

Notes:



60. A transformer set operating on 110 volts. A condenser is shunted around the contacts of the key to prevent sparking.

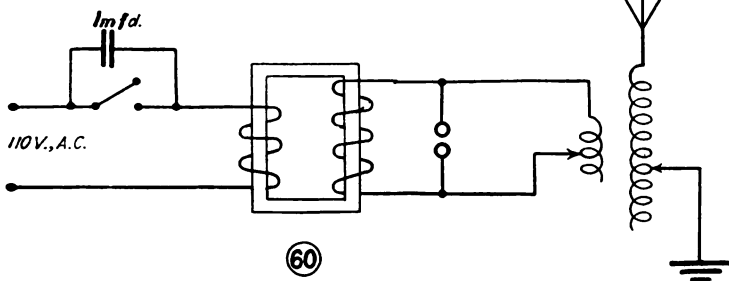
Notes:

61. This shows a switch to open the power circuit and the spark gap motor when the transmitter is not in use. Closing the switch starts the motor and closes the power supply to the transformer so that it is in readiness for the operation of the key.

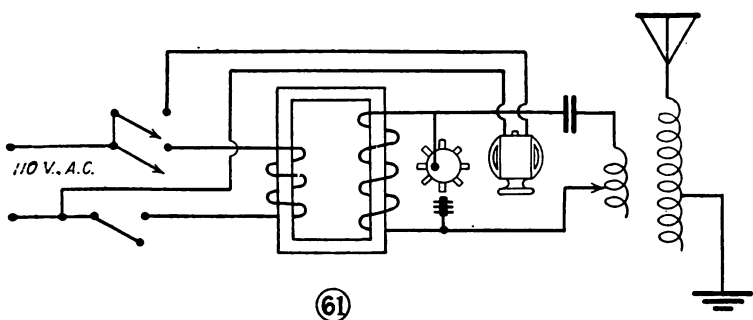
Notes:

62. Here a triple pole double throw switch changes the antenna and ground from sending to receiving and closes or opens the power circuit so that no transmitting can be done when the switch is connected for receiving.

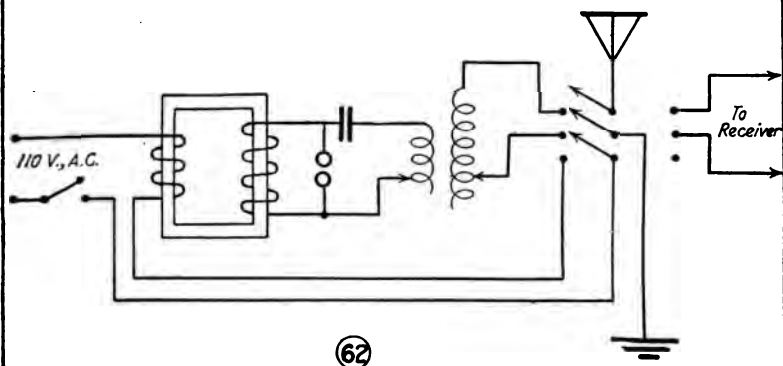
Notes:



60



61



62

63. Connections for a break-in system. A very small spark gap is put in the ground circuit. When the key is pressed, the antenna connection of the receiver is open, but when the key is up the receiver is connected for operation.

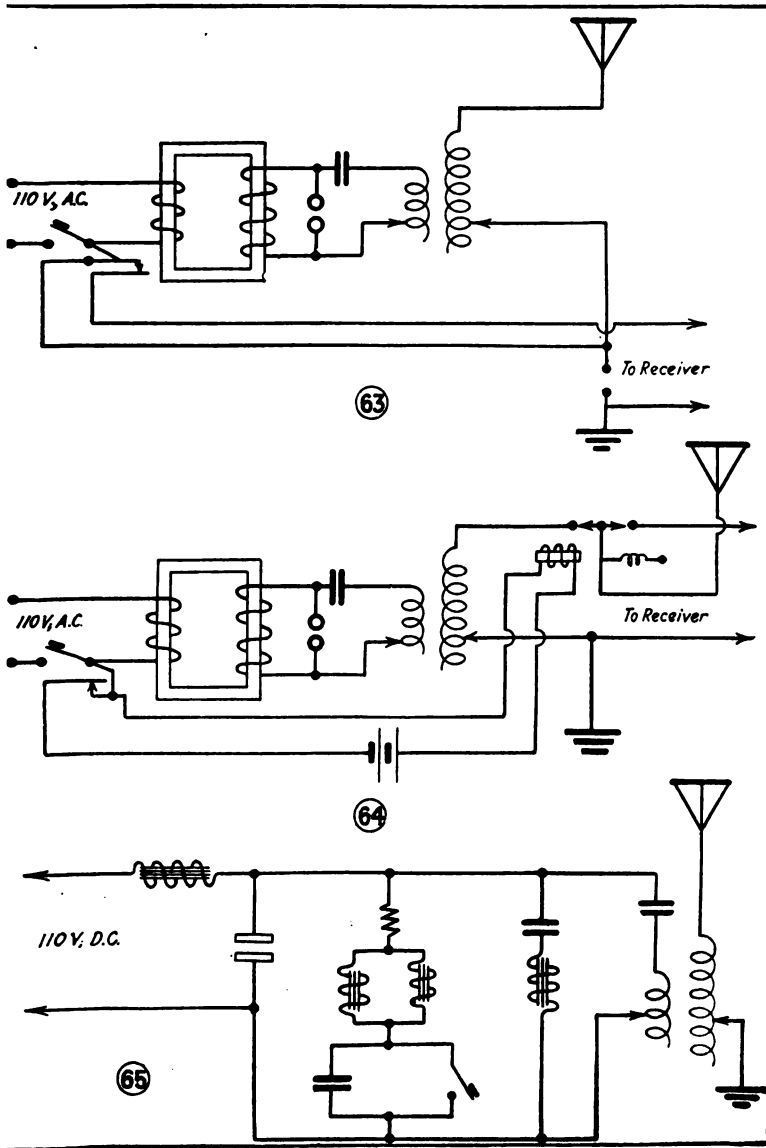
Notes:

64. In this circuit a relay is used to change the antenna from the transmitting to the receiving set. Ordinarily, the spring on the armature of the relay connects the antenna to the receiving set, but when the key is pressed the contact is closed by which the relay magnet is energized and the armature thrown over to join the antenna to the transmitter.

Notes:

65. The Chaffee gap operating on 110 volts, direct current with a tone circuit and starter. If the set is operated on alternating current the starter and tone circuit can be omitted. In this diagram a small resistance is connected in series with two impedances and a key shunted to a condenser across the gap. Another parallel circuit composed of a condenser and impedance, the natural period of which is within the audible range, are connected across the gap. Operating the key stops and starts the gap.

Notes:



66. A loop antenna used for undamped wave transmission. A tap is taken from the center of the loop and connected to the filament of the audion. For higher power several bulbs can be connected in parallel.

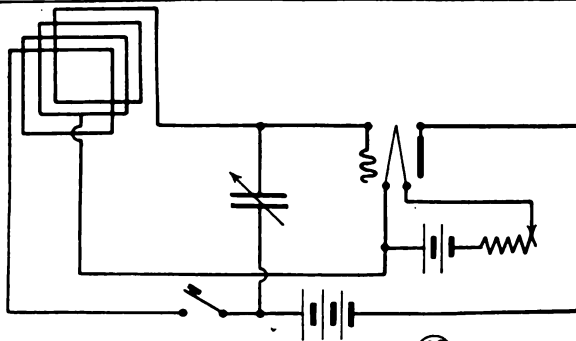
Notes:

67. Another way of connecting a loop antenna for undamped wave transmission. A hot wire ammeter is inserted in the lead to the loop to indicate the adjustment for maximum power. A telephone transmitter can be put in this circuit for telephonic transmission.

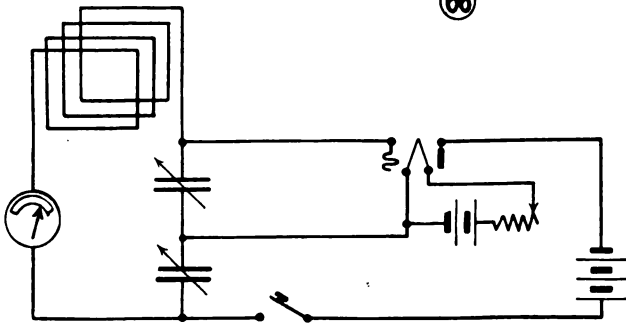
Notes:

68. This circuit will operate over a short range as a telephone transmitter or receiver. The grid condenser should have a maximum capacity of 0.0005 mfd. and the tuning condenser 0.001 mfd.

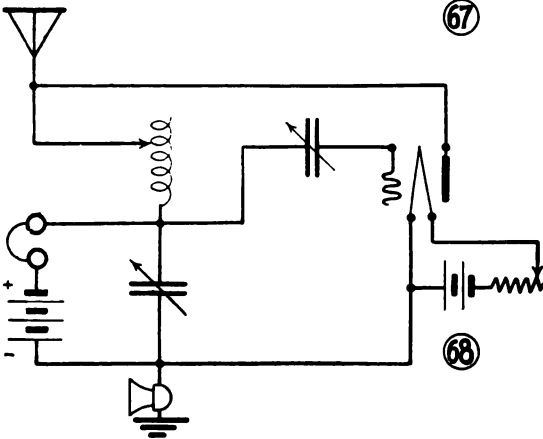
Notes:



66



67



68

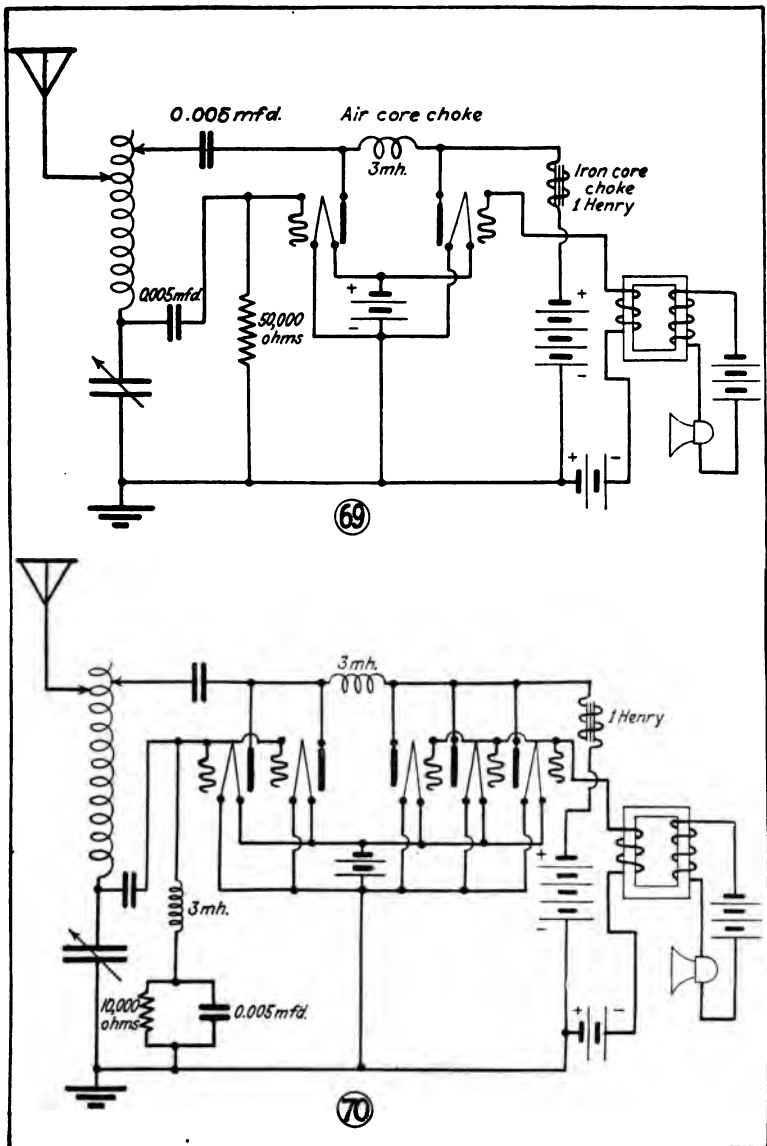


69. Telephone transmission can be carried on by connecting apparatus, as shown in this diagram. Very little explanation is needed, since the sizes of the coils and condensers are given. In place of the B battery a direct current generator of 100 to 350 volts can be used for long distance transmission. A battery is inserted in the grid of the modulator tube. The value of this negative voltage must be determined experimentally. A modulation transformer is needed. It is advisable to buy this instrument, as it is a difficult matter to make one at home.

Notes:

70. A high powered telephone transmitter is shown here connected in a manner similar to the set in 69. It is necessary ordinarily to use as many or more tubes in the modulator circuit as in the oscillator circuit. Considerable distances can be covered by a set of this kind if a high voltage is used in the plate circuits. When the values of the coils or condensers are not given they are the same as in 69.

Notes:

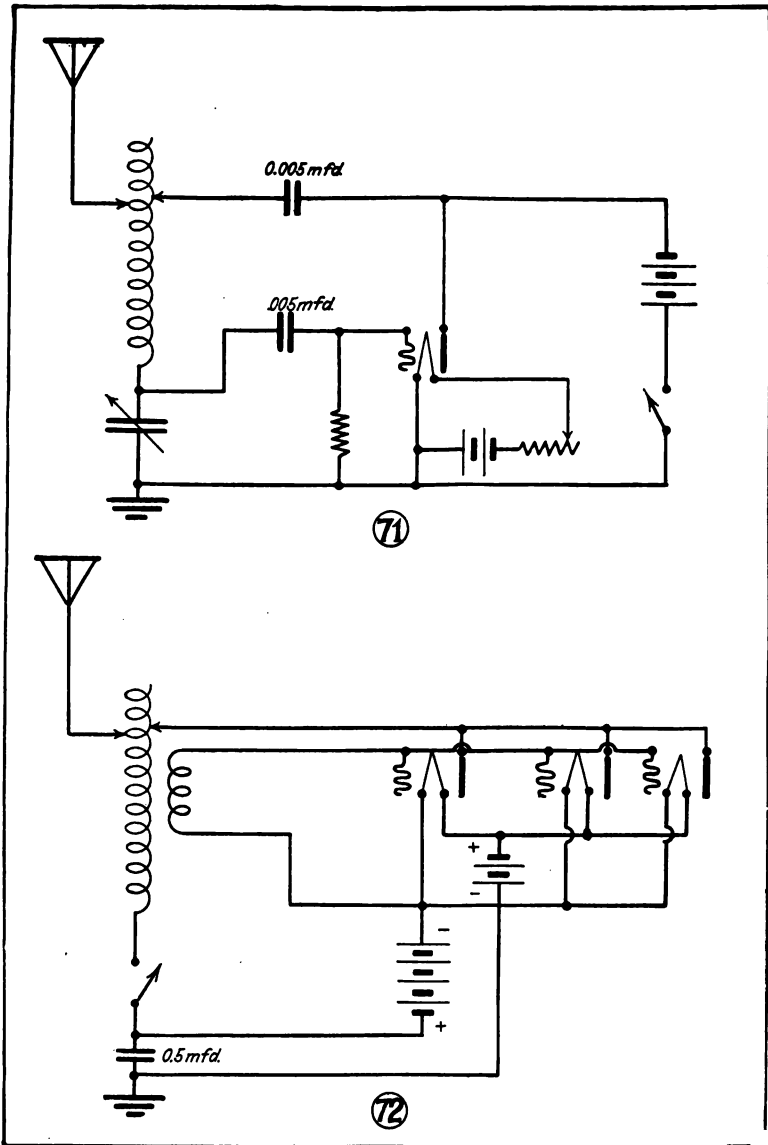


71. This circuit is suitable for short distance undamped wave telegraph transmission. It is also suitable for receiving if a pair of telephones is connected in the plate circuit. Telegraphic operation is carried on by means of the key inserted in the plate circuit.

Notes:

72. This is a high-powered undamped wave telegraph transmitter using three tubes in parallel. It is possible to have only two tubes or a number greater than three, depending upon the distance to be covered. The unique feature of this circuit is that no variable condensers are used, the capacity of the antenna providing all the capacity in the oscillating circuit. A small coil across the grid and filament, coupled to the tuning inductance provides the feed back coupling to maintain the circuit in oscillation.

Notes:

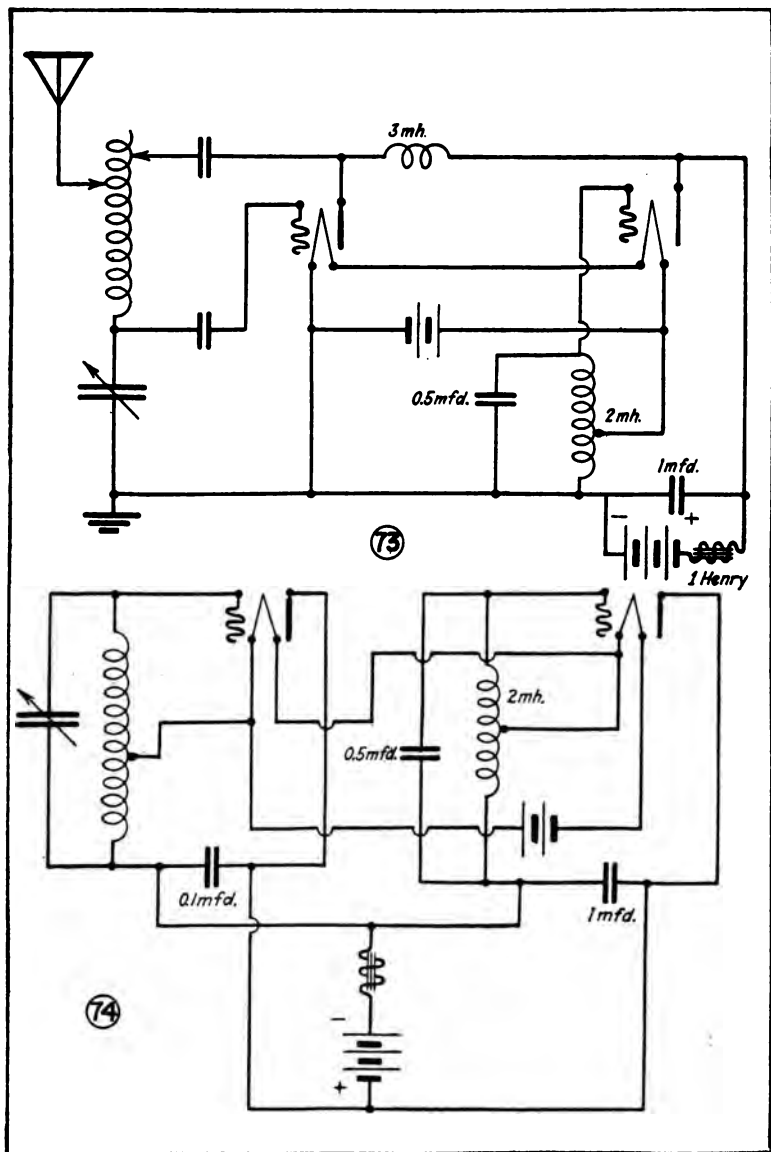


73. Connections for a modulated undamped wave transmitter are given in this diagram. The tube at the left operates as a radio frequency oscillator, while the tube at the right with the inductance and capacity provides an audio frequency oscillator which makes it possible to transmit on undamped waves, though they can be received with a crystal detector.

Notes :

74. A laboratory oscillator modulated by an audio frequency oscillator. This circuit is used for various kinds of experimental work. If the modulator is not required, it can be disconnected, in which case the circuit at the left will operate as a radio frequency undamped wave generator.

Notes :



75. This illustrates the method of measuring the wavelength of the primary of a radio transmitter. The antenna and ground are disconnected from the secondary of the oscillation transformer and a wavemeter coupled loosely to the primary. When the key is pressed a note will be heard in the wavemeter when it is adjusted to the wavelength of the primary circuit. This method can be used for either transformer or spark coil sets.

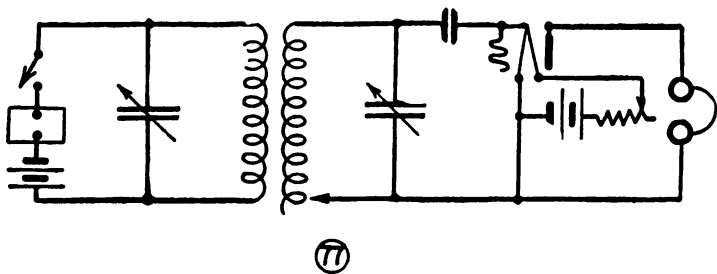
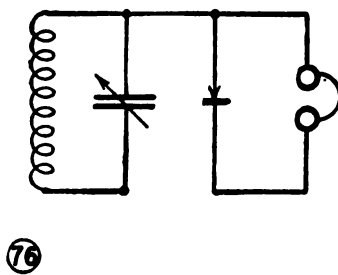
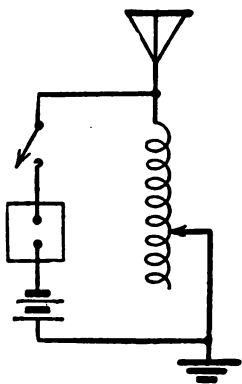
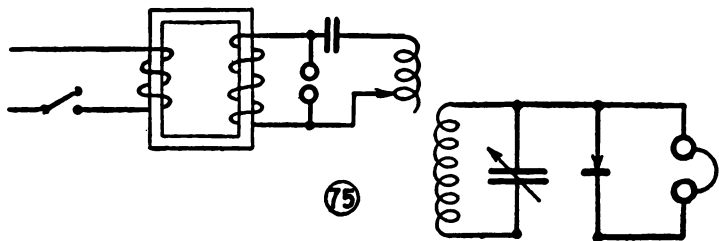
Notes:

76. To measure the wavelength of the secondary of a transmitter or primary of a loose coupler the other circuits should be disconnected and the buzzer and battery connected around the inductance. With the wavemeter coupled loosely to the coil a note will be heard when the two circuits are in resonance, that is, they have the same wavelength.

Notes:

77. The wavelength of the secondary of a receiving circuit can be measured by disconnecting the antenna and ground from the primary coil and coupling the wavemeter to the secondary. A buzzer is shunted around the inductance of the wavemeter. When the two circuits are in resonance a sound will be heard in the telephones of the receiving circuit.

Notes:





78. This circuit shows the manner in which the capacity of an antenna is measured. The switch is thrown to the right, the buzzer set in operation and the wavelength measured by means of the wavemeter. Then, without changing the adjustment of the wavemeter the switch is thrown to the left and the condenser adjusted until signals are again heard in the wavemeter. The capacity of the condenser at this point will be equal very closely, neglecting the inductance of the antenna, to the capacity of the antenna.

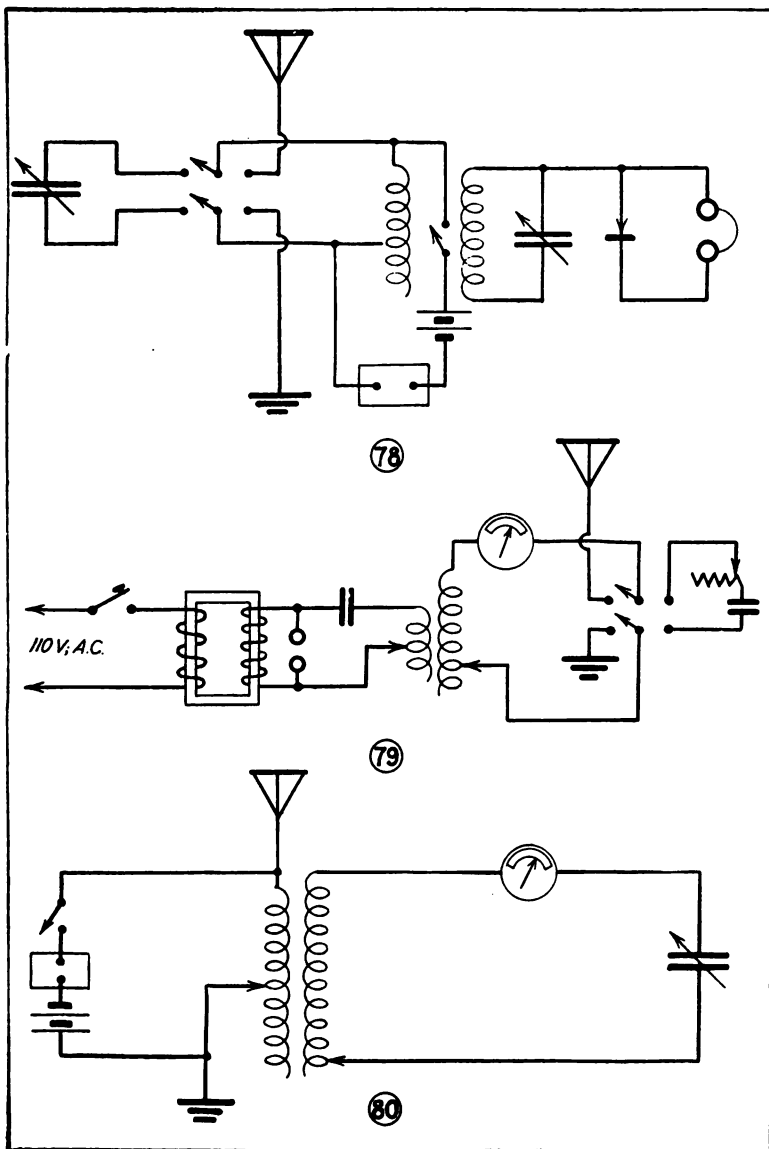
Notes:

79. The resistance of an antenna can be measured by using this circuit. The transmitter is first adjusted with the antenna and ground connected for maximum radiation as indicated by the hot wire ammeter. Then the switch is thrown to the right. This cuts in a variable non-inductive resistance and a condenser equal to the capacity of the antenna and ground. When the resistance is set at a value which gives the same reading of the ammeter as found ordinarily, the resistance in the circuit is equal to the resistance of the antenna.

Notes:

80. Another method for measuring the wavelength of an antenna circuit. In place of the telephones and detector connected with the wavemeter, a hot wire ammeter is inserted in the wavemeter circuit. When the antenna and wavemeter are in resonance the maximum indication will be given by the hot wire ammeter.

Notes:



81. This circuit is used for measuring either inductance or capacity by the use of a standard coil or condenser and a wavemeter. The capacity or inductance to be measured is put in the circuit at the left and a buzzer connected around the coil for excitation. When the wavelength has been found by means of

$\lambda^2$

the wavemeter the inductance is  $L = \frac{\lambda^2}{3552 C}$  or the

$\lambda^2$

capacity is  $C = \frac{\lambda^2}{3552 L}$

Where  $C$  = capacity in mfd.

$L$  = inductance in cms.

$\lambda$  = wavelength in meters.

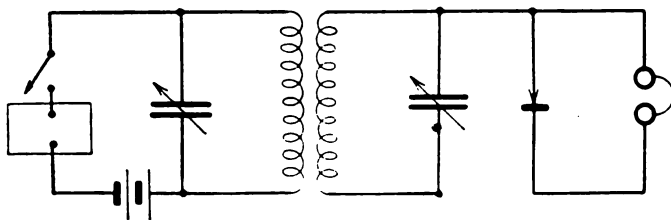
Notes:

82. A circuit for measuring the variation of plate current with changes of filament current in an audion detector. The meter marked  $I_a$  is an ammeter measuring up to 2 amperes and  $I_b$  a milliammeter or microammeter measuring up to 50 milliamperes.

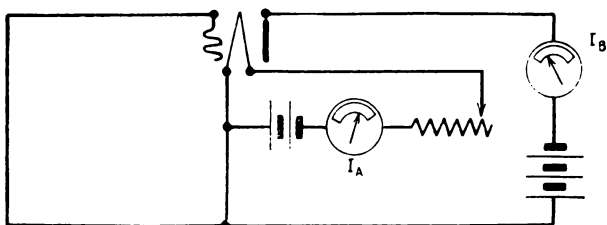
Notes:

83. By means of this circuit the variations of plate current with changes of plate voltage at various filament currents can be determined. The meters marked  $I_a$  and  $I_b$  are the same as in 82, while the  $E_b$  voltmeter should have a range up to the maximum voltage applied to the tube.

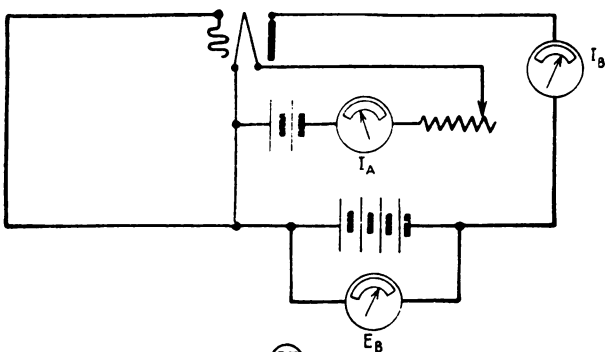
Notes:



(81)



(82)



(83)

84. The addition of a variable grid battery and voltmeter makes it possible to determine the plate current at different values of positive and negative grid voltage. Curves obtained in this manner are called the characteristic curves of the tubes.

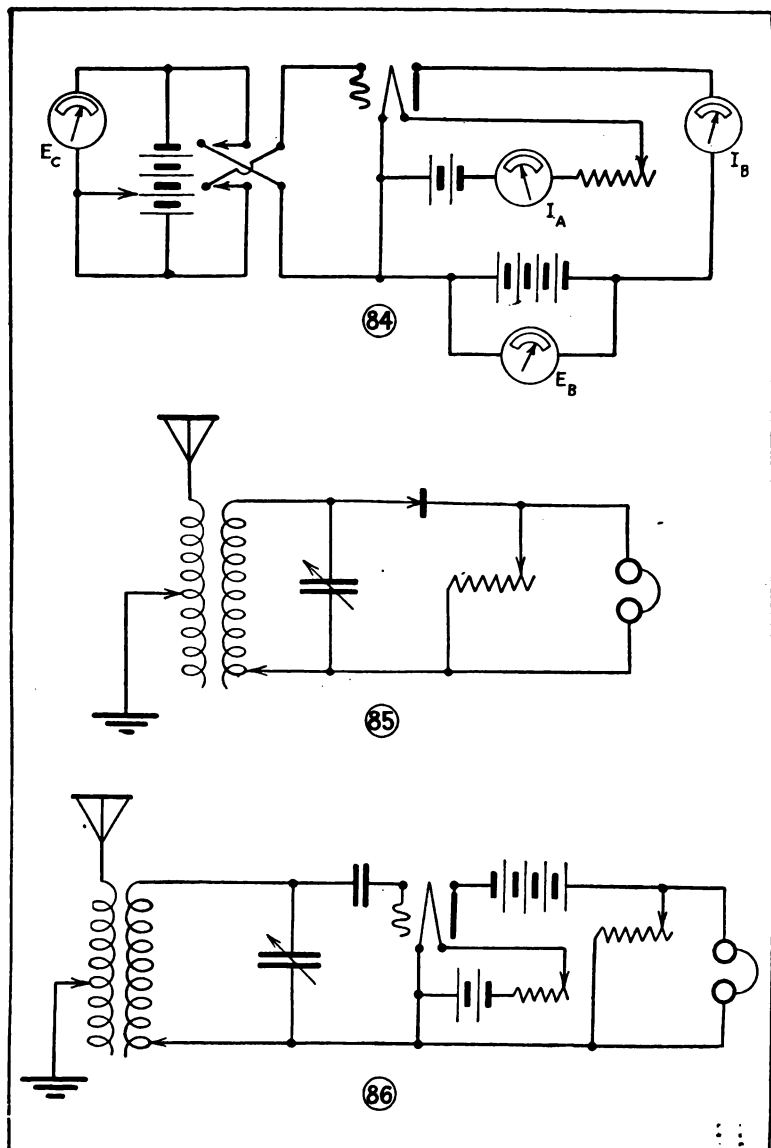
Notes:

85. This circuit is for measuring the audibility of signals using a crystal detector. A variable resistance is connected across the telephones. When the value of the resistance has been decreased until dots and dashes can just be distinguished the audibility is equal to the resistance of the telephones plus the resistance of the shunt divided by the resistance of the shunt.

Notes:

86. In this circuit the audibility meter is used with an audion receiver. The shunt resistance is operated in the same manner as described in 85, and the audibility factor determined in the same manner.

Notes:



## *Additional Circuits*

## ***Additional Circuits***

•

•



## ***Additional Circuits***

## ***Additional Circuits***

## ***Additional Circuits***

## ***Additional Circuits***

## *Additional Circuits*

## *Additional Circuits*

## ***Additional Circuits***

# CATALOGUE

of LATEST and BEST

## Radio Books

Our Standard and Up-to-date Radio Books are described in the following pages. They are Practical Books for the Practical man. Each written by an authority and in a manner that makes them easily understood.

Radio Hook-Ups by M. B. Sleeper,	\$ .75
Radio Design Data by M. B. Sleeper,	.75
Construction of New Type Trans-Atlantic Receiving Set by M. B. Sleeper,	.75
Construction of Radiophone and Telegraph Receivers for Beginners by M. B. Sleeper,	.75
How to Make Commercial Type Radio Apparatus by M. B. Sleeper,	.75
Wireless Telegraphy and Telephony Simply Explained by A. P. Morgan,	1.50
Experimental Wireless Stations by P. E. Edelman,	3.00
A B C of Vacuum Tubes Used in Radio Reception by E. H. Lewis,	1.00

---

Any of these books will be sent prepaid to any part of the world on receipt of price. Remit by Draft, Postal Order, Express Order or Registered Letter.

---

*Published and For Sale by*

**The Norman W. Henley Publishing Co.**

**2 West 45th Street, New York, U. S. A.**



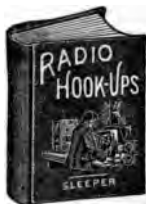
# RADIO HOOK-UPS

By M. B. SLEEPER

Price 75 Cents

**T**HIS is a very essential little volume to every radio experimenter. It contains the wiring diagrams of eighty-six different wireless circuits suitable for the reception of radio-telegraphy or radio-telephony. Suitable explanations accompany every diagram, and space is left for the experimenter to enter notes of his own regarding experimentation with the various hook-ups.

The diagrams commence with the simplest crystal detector sets and work up to the more complicated receiving circuits. One notable feature of the diagrams is the elimination of every unnecessary piece of apparatus from the circuits. There is not a single freak diagram in the volume. The book is indispensable to the radio amateur who designs or builds his own receiving apparatus.



---

## DESIGN DATA

For Radio Transmitters and Receivers

By M. B. SLEEPER

Price 75 Cents

**T**HE only book that gives tables and data for designing receiving and transmitting apparatus so that you need no knowledge of mathematics. It's the first book a beginner buys after he has learned the use his phone receiver.



Far from being a collection of formulas, DESIGN DATA takes up in proper sequence the problems encountered in planning all types of receiving sets for short, medium and long wave work, and spark coil, transformer and vacuum tube transmitters operating on 200 meters. Tables have been worked out so that values can be found without the use of mathematics.

Radio experimenters will find here information which will enable them to have the most modern and efficient equipment.

JUST PUBLISHED

# HOW TO MAKE COMMERCIAL TYPE RADIO APPARATUS

By M. B. SLEEPER

Fully Illustrated

Price **75** Cents

**F**OR the man who builds and designs his own equipment there is a lot of satisfaction in knowing that his apparatus is comparable to that of commercial design. The book describes in detail many commercial type of transmitting spark and vacuum tube sets, both telephone and telegraph and receiving equipment of all kinds. The experimenter will be able to get a world of ideas for the design and construction of his next piece of radio equipment from the very clear descriptions and the 98 clearly illustrated figures.

The table of contents gives one an idea of how completely the field is covered in this book.

## PART I—RECEIVING EQUIPMENT

- CHAPTER 1—Audion-Crystal Receiver.
- CHAPTER 2—An American Receiver for French Ships.
- CHAPTER 3—Long Wave Receiver.
- CHAPTER 4—Uni-Control Receiver.
- CHAPTER 5—Audion Control Box.
- CHAPTER 6—Two-Step Amplifier.

## PART II—TRANSMITTING EQUIPMENT

- CHAPTER 1—Duplex Radiophone Telephone Set.
- CHAPTER 2—Design Features of the S. C. R. 112.
- CHAPTER 3—High Efficiency 1 K. W. Transmitter.
- CHAPTER 4—Radio Equipment for Small Boats.
- CHAPTER 5—English Radio Equipment.

## PART III—AIRPLANE RADIO EQUIPMENT

- CHAPTER 1—The Use of Wireless Equipment on Transportation  
Planes and the Circumstances under which it must  
Operate.
- CHAPTER 2—200-Watt Airplane Radio Transmitter.
- CHAPTER 3—Radio Telephone Apparatus for Airplane Commu-  
nication.
- CHAPTER 4—Aircraft Radio Apparatus for Seaplanes and Dirigi-  
bles.
- CHAPTER 5—Light Weight Airplane Transmitter.

## PART IV—SPECIAL NOTES ON MISCELLANEOUS EQUIPMENT

- CHAPTER 1—Multi-Purpose Wavemeter.
- CHAPTER 2—An Instrument for the Production of Undamped  
Waves.
- CHAPTER 3—Bureau of Standards Long-Wave Wavemeter.
- CHAPTER 4—Construction Details of the Double Condenser.
- CHAPTER 5—Precision Radio Measuring Instruments.
- CHAPTER 6—Baldwin Type Telephone Receivers.
- CHAPTER 7—Manufacturing Details of the "B" Battery.

**FIFTH EDITION—JUST PUBLISHED**

# **Wireless Telegraphy and Telephony Simply Explained**

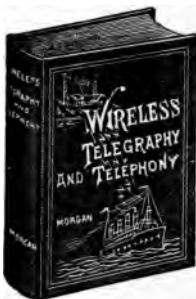
By **ALFRED P. MORGAN**

**154 Pages (5x7½)**

**156 Illustrations**

**Price \$1.50**

**T**his is undoubtedly one of the most comprehensive treatises on the subject, and a close study of its pages will enable one to master all the details of the wireless transmission of messages. The



author has filled a long-felt want and has succeeded in furnishing a lucid, comprehensive explanation in simple language of the theory and practice of wireless telegraphy and telephony.

This book treats the subject from an entirely new standpoint. It is well illustrated by over one hundred and fifty interesting photographs and drawings. All diagrams have been made in perspective showing the instruments as they actually appear in practice. The

drawings are carefully keyed and labelled. Many of the photographs are accompanied by phantom drawings which reveal the name and purpose of each part.

A book the wireless experimenter cannot afford to be without. It enables one to design and construct apparatus. Also valuable to the layman.

## **AMONG THE CONTENTS ARE:**

Introduction. The Means for Radiating and Intercepting Electric Waves. Aerial Systems. Earth Connection. The Transmitting Apparatus. The Receiving Apparatus. Tuning and Coupling. Directive Wave Telegraphy. Wireless in Army and Navy. Wireless on Aeroplane. How a Message is Sent and Received. The Telephone Transmitter and Receiver. The Thermophone. The Selenium Cell. The Wireless Telephone. The Difficulties of Wireless Telegraphy. A Simple Wireless Telephone. The Effects of Speech Upon Wireless Telephone Apparatus. The Requirements of Wireless Telephone Apparatus. The Production of Undamped Electrical Oscillations. The Paulsen Arc. Wireless Telephone Apparatus. The Majorana Transmitter. The Receiving Apparatus. The Audion. Transmission of Wireless Telephone Messages. Maxwell's Theory. Hertz's Discovery, etc.

## **WHAT IS SAID OF THIS BOOK:**

A simply-worded book, which can be heartily recommended.  
—*Scientific American*.

NEW EDITION

# EXPERIMENTAL WIRELESS STATIONS

By P. E. EDELMAN

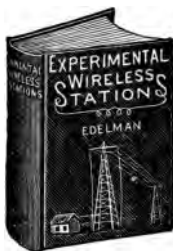
27 Chapters

392 Pages

167 Illustrations

Price **\$3.00**

**T**HE theory, design, construction and operation is fully treated including Wireless Telephony, Vacuum Tube, and quenched spark systems. The new and enlarged edition is just issued and is strictly up to date, correct and complete. This book tells



how to make apparatus to not only hear all telephoned and telegraphed radio messages, but also how to make simple equipment that works for transmission over reasonably long distances. Then there is a host of new information included. The first and only book to give you all the recent important radio improvements, some of which have never before been

published. This volume anticipates every need of the reader who wants the gist of the art, its principles, simplified calculations, apparatus dimensions, the understandable directions for efficient operation. Vacuum tube circuits; amplifiers; long-distance sets; loop, coil, and underground receivers, tables of wave-lengths, capacity, inductance; such are a few of the subjects presented in detail that satisfies. It is independent and one of the few that describe *all* modern systems.

Endorsed by foremost instructors for its clear accuracy, preferred by leading amateurs for its dependable designs. The new "EXPERIMENTAL WIRELESS STATIONS" is sure to be the most satisfactory for your purpose.

**JUST PUBLISHED!**

# **THE A B C OF VACUUM TUBES USED IN RADIO RECEPTION**

By **E. H. LEWIS, Assoc. I.R.E.**

Radio Instructor East Side Y. M. C. A., New York City

Fully Illustrated

**Price \$1.00**

**T**HIS is the book for the person who wishes to know what goes on the inside of a vacuum tube when it is used in a radio receiving circuit. It is especially valuable to the person who knows nothing about radio and very little if anything about electricity. No previous technical knowledge is necessary to understand it. The book is also of great value to the experimenter who is just taking up the fascinating study of vacuum tube operation.



Starting with an explanation of elementary electrical terms, and list of symbols the functioning of various vacuum tubes as detectors and amplifiers is explained step by step in an easily understandable manner. The subject of speech distortion, one of the difficulties frequently encountered in radiophone reception today, is discussed and its elimination pointed out. Various practical circuits are shown and discussed. No technical terms are used without their meaning being first explained.

No owner or prospective owner of a radiophone receiver should be without the knowledge to be gained from this elementary book.

## **TABLE OF CONTENTS**

### **CHAPTER I—INTRODUCTORY**

Electric Current—Electrical Pressure or Electromotive Force—Resistance—Direct Current—Alternating Current—Frequency—Inductance—Capacitance—Resonance—Oscillations—The Reception of Signals—Wave Length—Tuning the Receiving Antenna—The Antenna as a Complete Circuit.

### **CHAPTER II—THE VACUUM TUBE AS A RECTIFIER AND RELAY WITHOUT MOVING PARTS**

Tube Construction—The Edison Effect—Electron Emission from a Heated Filament—Dependence of Plate Current upon Plate Potential—Dependence of Plate Current upon Filament Current—Effect of Grid Potential upon Plate Current—Relay Action—Rectification

### **CHAPTER III—THE VACUUM TUBE DETECTOR**

The Telephone Receiver—Simple Detection—Detection with Grid Condenser—Effect of Gas in a Detector Tube—Heterodyne Action or the Production of Beats.

### **CHAPTER IV—THE VACUUM TUBE AMPLIFIER**

General Characteristics—Audio Frequency Amplification—Radio Frequency Amplification—Radio Frequency Regenerative Amplification—Autodyne Production of Beats.

### **CHAPTER V—PRACTICAL CIRCUITS AND THEIR OPERATION**

Methods of Coupling—The Variometer—Inter-Electrode Tube Capacitance—Wave Length, Frequency and Resonance—Circuits and Explanations of their Arrangement and Operation.

### **CHAPTER VI—VOICE DISTORTION**

Amplifier Transformers—Normal Grid Potential—Too Great Regeneration—Telephone Receiver.

### **CHAPTER VII—PRACTICAL QUESTIONS AND ANSWERS**

JUST PUBLISHED

# **Construction of New Type Transatlantic Receiving Sets**

By M. B. SLEEPER

Fully Illustrated

Price **75 Cents**

**I**N addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

## **CHAPTER I.**

**Transatlantic Reception on Long Waves.**

## **CHAPTER II.**

**Single Circuit Receiver.**

## **CHAPTER III.**

**Loosely Coupled Oscillating Receiver.**

## **CHAPTER IV.**

**High Efficiency Long Wave Receiver.**

## **CHAPTER V.**

**Loud Speakers, Relays and Phonograph Receivers.**

## **CHAPTER VI.**

**Homemade Wavemeters.**

JUST PUBLISHED

## **Construction of Radiophone and Telegraph Receivers for Beginners**

By **M. B. SLEEPER**

Fully Illustrated

Price **75** Cents

**T**HE man who wants to feel the real thrill of accomplishment, and who is not satisfied in the merely making use of what others have done for him, builds his own radio apparatus. Experimenters and novices must take their instructions from reliable sources, however, to assure the success of their work. Radio men can follow the data in "Radio Phone and Telegraph Receivers" in full confidence because each piece of apparatus described was first made, tested, and found efficient before the final design was accepted. Special receivers, both crystal and audion, are shown in detail. Regenerative circuits as well as audio and radio frequency amplifiers are described and illustrated by clear photos, diagrams, and working drawings prepared especially for the novice and the man who wants to receive what is being broadcasted daily by the Broadcasting Stations. A special feature is the phonograph type radio set and the loud speaker which is suitable for installation in the parlor or livingroom of the home.

CHAPTER I—Erection of Sending and Receiving Antennas.  
CHAPTER II—Building a Two Slide Tuning Coil.  
CHAPTER III—Installing and Connecting up a Simple Receiver.  
CHAPTER IV—A Receiver for Navy Code Practice.  
CHAPTER V—Receiving Instruments on Standardized Panels.  
CHAPTER VI—Some Ideas on a Crystal Receiver.  
CHAPTER VII—Audion Control Panels.  
CHAPTER VIII—Construction of a Portable Receiver.  
CHAPTER IX—Crystal Receiver 200 to 600 Meters.  
CHAPTER X—The Use of Concentrated Induction Coils.  
CHAPTER XI—A Simple Regenerative Receiver.  
CHAPTER XII—Variometer Type Regenerative Receiver.  
CHAPTER XIII—Two Step Audio Frequency Amplifier.  
CHAPTER XIV—Building a Radio Frequency Amplifying Transformer.  
CHAPTER XV—Radio and Audio Frequency Amplifier.  
CHAPTER XVI—Radio Frequency Amplifier Without Transformers.  
CHAPTER XVII—The Loud Speaking Telephone Receiver and Amplifier.  
CHAPTER XVIII—The Radio Set for the Parlor.

# LATEST ELECTRICAL BOOKS

---

## Treating on Dynamos, Electric Bells, Telephones, High Frequency, Wireless

---

### Arithmetic of Electricity.

By PROF. T. O'CONOR SLOANE. A practical treatise on electrical calculations of all kinds reduced to a series of rules, all of the simplest forms, and involving only ordinary arithmetic; each rule illustrated by one or more practical problems with detailed solution of each one. This book is classed among the most useful works published on the science of electricity, covering as it does the mathematics of electricity in a manner that will attract the attention of those who are not familiar with algebraical formulas. 200 pages. New Revised and Enlarged Edition. **Price, \$1.50**

### Commutator Construction.

By WILLIAM BAXTER, JR. The business end of dynamo or motor of the direct-current type is the commutator. This book goes into the designing, building and maintenance of commutators, shows how to locate troubles and how to remedy them; everyone who fusses with dynamos needs this. Fourth edition. **Price, 35 cents**

### Construction of a Transatlantic Wireless Receiving Set.

By L. G. PACENT and T. S. CURTIS. A work for the Radio student who desires to construct and operate apparatus that will permit of the reception of messages from the large stations in Europe with an aerial of amateur proportions. 36 pages. 23 illustrations. Cloth. **Price, 35 cents**

### Dynamo Building for Amateurs, or How to Construct a Fifty Watt Dynamo.

By ARTHUR J. WEED. A practical treatise showing in detail the construction of a small dynamo or motor, the entire machine work of which can be done on a small foot lathe. Dimensioned working drawings are given for each piece of machine work, and each operation is clearly described. This machine, when used as a dynamo, has an output of fifty watts; when used as a motor it will drive a small drill press or lathe. It can be used to drive a sewing machine on any and all ordinary work. The book is illustrated with more than sixty original engravings showing the actual construction of the different parts. **Price, \$1.00**



## **Design Data for Radio Transmitters and Receivers.**

By B. M. SLEEPER. Far from being a collection of formulas, Design Data takes up in proper sequence the problems encountered in planning all types of receiving sets for short, medium and long wave work, and spark coil, transformer and vacuum tube transmitters operating on 200 meters. Tables have been worked out so that values can be found without the use of mathematics. Radio experimenters will find here information which will enable them to have the most modern and efficient equipment. **Price, 75 cents**

## **Dynamos and Electric Motors and All About Them.**

By EDWARD TREVERT. This volume gives practical directions for building a two H. P. Dynamo of the Edison type capable of lighting about fifty mazda lamps of the 20-watt size. In addition, it gives directions for building two small electric motors suitable for running sewing machines. The concluding chapter describes the construction of a simple bicromate battery adapted for running electric motors. 96 pages. Fully illustrated with detail drawings. Cloth. **Price, \$1.00**

## **Electric Bells.**

By M. B. SLEEPER. A complete treatise for the practical worker in installing, operating and testing bell circuits, burglar alarms, thermostats and other apparatus used with electric bells. Both the electrician and the experimenter will find in this book new material which is essential in their work. Tools, bells, batteries, unusual circuits, burglar alarms, annunciators, systems, thermostats, circuit breakers, time alarms, and other apparatus used in bell circuits are described from the standpoints of their application, construction, and repair. The detailed instructions for building the apparatus will appeal to the experimenter particularly. The practical worker will find the chapters on Wiring Calculation of Wire Sizes and Magnet Windings, Upkeep of Systems and the Location of Faults of the greatest value in their work. 124 pages. Fully illustrated. **Price, 75 cents**

## **Experimental High Frequency Apparatus, How to Make and Use It.**

By THOMAS STANLEY CURTIS. This book tells you how to build simply high-frequency coils for experimental purposes in the home, school laboratory, or on the small lecture platform. The book is really a supplement to the same author's "High Frequency Apparatus." The experimental side only is covered in this volume, which is intended for those who want to build small coils giving up to an eighteen-inch spark. The apparatus is simple, cheap and perfectly safe, and with it some truly startling experiments may be performed. 69 pages, illustrated. **Price, 50 cents**

### **Electrician's Handy Book.**

By PROF. T. O'CONOR SLOANE. This work has just been revised and much enlarged. It is intended for the practical electrician who has to make things go. The entire field of electricity is covered within its pages. It is a work of the most modern practice, written in a clear, comprehensive manner, and covers the subject thoroughly, beginning at the A B C of the subject, and gradually takes you to the more advanced branches of the science. It teaches you just what you should know about electricity. A practical work for the practical man. Contains forty-eight chapters.

The publishers consider themselves fortunate in having secured the services of such a well and favorably known writer as Prof. Sloane, who has with the greatest care completed a master work in concise form on this all-important subject. 600 engravings, 824 pages, handsomely bound in cloth. New Revised Edition. **Price, \$4.00**

### **Electricity Simplified.**

By PROF. T. O'CONOR SLOANE. The object of "Electricity Simplified" is to make the subject as plain as possible and to show what the modern conception of electricity is; to show how two plates of different metals immersed in acid can send a message around the globe; to explain how a bundle of copper wire rotated by a steam engine can be the agent in lighting our streets; to tell what the volt, ohm and ampere are, and what high and low tension mean; and to answer the questions that perpetually arise in the mind in this age of electricity. 218 pages. Illustrated. Fifteenth edition. **Price, \$1.50**

### **Electric Wiring, Diagrams and Switchboards.**

By NEWTON HARRISON, with additions by THOMAS POPPE. This is the only complete work issued showing and telling you what you should know about direct and alternating current wiring. The work is free from advanced technicalities and mathematics, arithmetic being used throughout. It is in every respect a handy, well-written, instructive, comprehensive volume on wiring for the wireman, foreman, contractor or electrician. Third revised edition. 315 pages, 130 illustrations. **Price, \$2.50**

### **Experimental Wireless Stations.**

By P. E. EDELMAN. The theory, design, construction and operation is fully treated, including Wireless Telephony, Vacuum Tube, and quenched spark systems. The new enlarged 1920 edition is just issued and is strictly up to date, correct and complete. This book tells how to make apparatus to not only hear all telephoned radio messages, but also how to make simple equipment that works for transmission over reasonably long distances. Then there is a host of new information included. The first and only book to give you all the recent important radio improvements, some of which have never before been published. 392 pages. 24 chapters. 167 illustrations. **Price, \$3.00**

### **Electric Toy Making, Dynamo Building and Electric Motor Construction.**

This work treats of the making at home of electrical toys, electrical apparatus, motors, dynamos and instruments in general and is designed to bring within the reach of young and old the manufacture of genuine and useful electrical appliances. 210 pages, cloth. Fully illustrated. Twentieth edition, enlarged. **Price, \$1.50**

### **High Frequency Apparatus, Its Construction and Practical Application.**

By THOMAS STANLEY CURTIS. The most comprehensive and thorough work on this interesting subject ever produced. The book is essentially practical in its treatment and it constitutes an accurate record of the researches of its author over a period of several years, during which time dozens of coils were built and experimented with. New revised and enlarged edition. Fully illustrated. 269 pages. **Price, \$3.00**

### **House Wiring.**

By THOMAS W. POPPE. Describing and illustrating up-to-date methods of installing electric light wiring. Contains just the information needed for successful wiring of a building. Fully illustrated with diagrams and plans. It solves all wiring problems and contains nothing that conflicts with the rulings of the National Board of Fire Underwriters. 1920 edition, revised and enlarged. Including Direct Current Motor Connections—Diagrams of series wound motor—and Motor Wiring. 200 pages, fully illustrated, flexible cloth. **Price, \$1.00**

### **How to Become a Successful Electrician.**

By PROF. T. O'CONOR SLOANE. An interesting book from cover to cover. Telling in simplest language the surest and easiest way to become a successful electrician. The studies to be followed, methods of work, field of operation and the requirements of the successful electrician are pointed out and fully explained. 202 pages. Illustrated. Eighteenth revised edition. Cloth. **Price, \$1.50**

### **Radio Time Signal Receiver.**

By AUSTIN C. LESCABOURA. This new book, "A Radio Time Signal Receiver," tells you how to build a simple outfit designed expressly for the beginner. You can build the outfit in your own workshop and install them for jewelers either on a one-payment or a rental basis. The apparatus is of such simple design that it may be made by the average amateur mechanic possessing a few ordinary tools. 42 pages. Paper. **Price, 35 cents**

### **Radio Hook-Ups.**

In this book the best circuits for different instruments and various purposes have been carefully selected and grouped together. All the best circuits for damped and undamped wave receiving sets, buzzer, spark coil and transformer sending equipment, as well as vacuum tube telegraph and telephone transmitters, wavemeters, vacuum tube measuring instruments, audibility meters, etc., are shown in this book.

**Price, 75 cents**

### **Standard Electrical Dictionary.**

By PROF. T. O'CONOR SLOANE. Just issued an entirely new edition brought up to date and greatly enlarged—as a reference book this work is beyond comparison, as it contains over 700 pages, nearly 500 illustrations, and definitions of about 6,000 distinct words, terms and phrases. The definitions are terse and concise and include every term used in electrical science.

In its arrangement and typography the book is very convenient. The word or term defined is printed in black faced type which readily catches the eye, while the body of the page is in smaller but distinct type. The definitions are well worded, and so as to be understood by the non-technical reader. The general plan is to give an exact, concise definition, and then amplify and explain in a more popular way. Synonyms are also given, and references to other words and phrases are made. This work is absolutely indispensable to all in any way interested in electrical science, from the higher electrical expert to the everyday electrical workman. In fact, it should be in the possession of all who desire to keep abreast with the progress of this branch of science.

New enlarged edition. 767 pages. 477 illustrations.

**Price, \$5.00**

### **Storage Batteries Simplified.**

By VICTOR W. PAGE, M.S.A.E. This is the most thorough and authoritative treatise ever published on this subject. It is written in easily understandable, non-technical language so that anyone may grasp the basic principles of storage battery action as well as their practical industrial applications. All electric and gasoline automobiles use storage batteries. Every automobile repairman, dealer or salesman should have a good knowledge of maintenance and repair of these important elements of the motor car mechanism. This book not only tells how to charge, care for and rebuild storage batteries but also outlines all the industrial uses. Learn how they run street cars, locomotives and factory trucks. Get an understanding of the important functions they perform in submarine boats, isolated lighting plants, railway switch and signal systems, marine applications, etc. This book tells how they are used in central station standby service, for starting automobile motors and in ignition systems. Every practical use of the modern storage battery is outlined in this treatise. 208 pages, fully illustrated.

**Price, \$2.00**

